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The British Iron Trade, Past and Present.

A step has been resolved upon by the ironmasters of South Wales which is fraught with grave consequences—the entire abandonment of the iron mines at the great works of this district, and in the adjacent mineral fields of Monmouthshire. This appears to be only part of a larger plan which has been seriously considered and well matured, to gradually effect the transfer, where possible, of the capital now floating in iron manufacture, to the more remunerative channels of industry in the coal trade. Ironmasters are not usually pessimists, but they are beginning to say that the making of iron, so far as it is associated with the making of wealth, is an exhausted idea. The great fortunes that have been built up by historic families from the Welsh ironworks are all events of a former age. The immense personalty of which William Crawshay, of Caversham, died possessed, and which in great part descended to his son, the present owner of Cyfarthfa, was the result of heriditary accumulation through four generations. The vast property in lands and money which Sir Ivor Guest, the owner of Dowlais, inherited from his father, was won by that sturdy old ironmaster by plodding and untiring perseverance in days when Welsh iron had no rival, was in great demand, and could be cheaply made. The Homfrays, the Foremans, the Baileys, and other well-known names, "familiar in our mouths as household words," gathered in their riches also in those early days, and did so partly because they were placed in the way of the flood-tide which bore them on to fortune—which was an accident—and partly because master and man worked together upon an old-fashioned, patriarchal system of co-operation, the one giving of his profit in times of abundance, and the other reciprocating the kindly feeling by sharing the burden of periods of depression. These large fortunes all belong to the golden era, now long past. For many recent years the history of the iron trade in South Wales has been a chronicle of misfortunes. At Tondu, which now belongs to Mr. Brogden's company, where work was resumed on Monday, £100,000 was sunk by the former owner, who then became bankrupt. £135,000 were expended at Maesteg without profit before the works were bought by the present owners. At Plymouth and Pentrebach £400,000 were invested, and the works were afterwards sold a bargain to Mr. Fothergill, M. P. The Monmouthshire Iron and Coal Company was started with a capital of £300,000 forty years ago. The money has long since departed, and the company died of atrophy. Victoria ironworks cost £160,000, and were sold for £50,000. Ebbw Vale works ruined their former proprietors, and came into the hands of another firm, who sank a large capital, and losing £500,000 by the Erie Railway, had to arrange with their creditors. Blaina ironworks, after exhausting the funds of their projector, were sold to a company who expended £200,000 and then abandoned them. Cwmbran, built for £80,000, sold for £3,000; Abersychan, on which £200,000 were spent by a company who ran through a capital of £2,000,000, were sold for £10,000. For one establishment of ironworks which becomes profitable, there are ten which have brought loss or ruin upon their owners. Mr. Fothergill has stated that he will not re-open Penydarran works, and Mr. Philips, one of the directors of the Ebbw Vale Company, says positively that no more iron shall be made at Abersychan. When it is remembered that the foundation of the prosperity of South Wales has been its iron manufactures, and that ironmaking there has only been successful—where success may have followed—because large deposits of metalliferous ore were found in juxtaposition with valuable seams of coal, the magnitude of the effects of the startling change can be seen at once. Remove, exhaust, or abandon the iron mines, and the *raison d'être* of ironworks in and around Merthyr no longer exists. It would cost no more to convey the coal to blast furnaces anywhere else than it would to bring ore from the Cleveland hills or the pregnant hæmatite beds of Spain. The Ebbw Vale Company has already built smelting furnaces near Bilbao, and are the owners of a fleet of vessels which carry out coal and bring pig iron back. The Dowlais Company intend to follow a similar course, and if their example is copied by the ironmasters, as is not unlikely, for the action of the men has not entitled them to much consideration, we may see a transfer of vast capital to a land where labor is cheap and well disciplined. The excessive price of coal is exercising a depressing effect on the trade of the north of England; indeed, every manufacturing center is keenly feeling the dearth of fuel, with the exception, perhaps, of South Yorkshire, where the owners of most of the large ironworks seem not to be so greatly inconvenienced for want of fuel and raw material. This arises from several of them having mines of their own or being in possession of favorable leases. The make of pig iron shows no falling off, in fact, the demand is such that the productive powers of makers are strained to keep up with it. A good deal of ore is being received from North Lincolnshire, to which place the wagons return loaded with coke. Throughout Derbyshire the iron trade is in a healthy state, and there is a fair demand for most kinds of manufactured iron. Notwithstanding the numerous difficulties encountered by manufacturers in obtaining continuous and sufficient supplies of raw material and fuel, the iron of West Yorkshire is exceedingly good. The prices of finished iron are firm, and orders are being offered with greater freedom than ever, but makers are chary of excepting orders for future execution, and this disinclination to undertake new work will doubtless continue until there is some alteration in regard to the supply of fuel. In Scotland there has been no decided change during the past week, and consequently the fluctuations in price, although numerous, have not taken any wide range. The deliveries of iron *ex store* still go on, and as the interruptions to the production have this year prevented the makers accumulating stock, as they usually do during winter, the position, notwithstanding the extreme price, is wonderfully strong. The prices of makers' iron, reported this week, remain steady, about the maximum. In Staffordshire, even at 20s. a ton advance upon last week's rates, finished iron is difficult to get, and the consumers are ready to give the rise of 2s. per ton on slack as well as large coals. Portions of works are standing idle for want of fuel. Masters are becoming greatly annoyed at the indolence of the men, and many will not accept orders at any price, that, if necessary, they may resent it by closing their works. Circulars from the best sheet-makers withdraw all previous quotations.—*London Mining World.*

On the Magnetites of Clifton in St. Lawrence County, New York.*

PROF. SILLIMAN made a verbal communication upon the occurrence of magnetites in the Laurentian rocks in the town of Clifton, St. Lawrence County, New York. The Clifton mining company have opened these magnetites upon their estate of 23,000 acres, upon the waters of the Grasse River, an affluent of the St. Lawrence, which flows for about nine miles across the estate, exposing a section of the formation, and affording ample water power at numerous points. In approaching this district from De Kalb Junction upon the Watertown and Ogdensburg railway, the observer passes from the zone of the specular ores, which abound to a great extent in Jefferson County, across a belt of non metalliferous limestones, which continues for some miles intermingled with metamorphic rocks, gradually giving place to heavy beds of granitic and porphyritic gneiss, the weathered surfaces of which present a gray and rough appearance, from the washing out of the feldspar, leaving the quartz very prominent, and completely disguising the real character of the rock, which, when freshly broken, has a lively reddish appearance from the predominance of flesh-colored and red feldspar. Beds of fine-grained quartzite appear also intercalated in the granitic gneiss. These are the dominating rocks of the magnetite region, but the magnetite is always found, so far as the speaker's observation extended, associated with beds of calcite, carrying hornblende, black and green, biotite, and brown garnet interspersed with yellow and magnetic pyrites. The strike of these rocks is about northeast, and their dip about 40 to 45° southeast. Prof. SILLIMAN exhibited an approximate section of the Dodge ore hill, in which the most important exploitation has been made for ores upon this property, showing the relative position of these beds of magnetite, and two of limestone (calcite) of conformable dip to the formation, and paralled to each other. This hill is from 100 to 120 feet above the adjoining valley at the steel works, and near its summit the magnetite crops out under the glacial drift, and carries yet the glacial scratches on its smoothed and rounded surface. This bed has been laid bare by what is known as the Dodge Opening, or "Big Pit," upon a vein of magnetite which averages about twenty feet in thickness, for a distance of 400 to 500 feet, to the level of about thirty feet, and is provided with a tramway for a locomotive. This is the terminus of a line of about twenty miles of railway, *built wholly of wood*, for carrying these ores to market. A few months' use served to reduce the wooden rails to splinters, and render quite useless an expenditure

* Remarks before the American Institute of Mining Engineers, at their meeting in Boston March 12, 1873.

of several hundred thousand dollars. The Dodge vein is contained between walls of granitic gneiss, but is sprinkled in places with white calcite, mica, garnet, etc. Above it is a bed of pink and white calcite from 12 to 15 feet in thickness. This is opened by a tunnel at the northeast end of the hill and affords a flux which appears to be free from any objectionable minerals, and far better than the flux actually used in the charcoal furnace. There is a bed of blue quartzose gneiss above the line and in contact with it. The Dodge vein which is also called the Arendal vein, is likewise opened beyond the open cut to the southwest, by a whim shaft, sunk for the width of the ore (20 feet at right angles to the walls,) to a depth of about 30 feet from the surface. From this exploration Prof. SILLIMAN obtained a carefully prepared mining sample which was analyzed at the Laboratory of the School of Mines in New York, with the following result:

The samples of Magnetic Iron Ore from Prof. B. SILLIMAN, marked "All parts Whim Shaft, Arendal Vein," submitted for examination, contain—

		Equivalent to	
Magnetic Oxide of Iron	79.29	Metallic Iron	57.42
Oxide of Manganese	0.35	Metallic Manganese	0.23
Alumina	3.45	Phosphorus	0.14
Lime	4.46	Sulphur	0.35
Magnesia	3.09		
Sulphur	0.35		
Phosphoric Acid	0.32		
Silicic Acid	8.32		
Water	0.51		
	100.14		

A charcoal furnace situated at Great Falls on the Grasse river, about two and a half miles from the Dodge opening, was run for some time exclusively upon the ores obtained from this vein. The flux used was a very impure limestone, a coarsely crystalline and granular calcite, carrying a considerable quantity of green pargasite (magnesia-lime-iron-amphibole,) disseminated in grains through the flux. This will account probably for the considerable amount of silicon found in the subjoined analyses of the pig, produced from this ore and flux, as well as for the sluggish slags formed in the furnace. These analyses of pig are interesting, as they represent more nearly than any ore sample can do the character of the ore, and especially the relatively small amount of sulphur and phosphorus which is concentrated in the pig metal by the process of smelting. The analyses are as follows:

The sample of pig iron, from St. Lawrence County, N. Y., marked "Clifton Iron Co.," submitted for examination, contains—

	No. 1, Close Grain, Gray Pig.	No. 2, Close Grain, Gray Pig.
Carbon	3.94	3 30
Silicon	2.21	4.48
Manganese	0.11	0.12
Sulphur	0.04	0.11
Phosphorus	0.22	0.15
Iron and undetermined	93.48	91.84
	100.00	100.00

The ores, before smelting, were roasted in open heaps, with wood and charcoal dust. While the analysis of the sample above given, and of the pig metal, both show the content of phosphorus in excess of the demands of the Bessemer process, it is quite possible to select crystalline magnetites here which are of remarkable beauty and freedom from sulphur and phosphorus. This is shown by the following analysis of a hand specimen, from the most southerly portion of the property examined:

No. 7. Magnetite (above lower tunnel.)		Equivalent to	
Magnetic Oxide of Iron	80.91	Metallic Iron	58.59
Oxide of Manganese	0.42	Metallic Manganese	0.29
Sulphur	0.08	Phosphorus	0.01
Phosphoric Acid	0.03	Sulphur	0.08
Silicic Acid	8.77		

Over the Dodge or Arendal vein, is another well characterized ore body, about eight feet in thickness, opened by an open cut along its course for 200 to 300 feet, and by a slope sunk nearly 90 feet upon it. This is called the St. Lawrence vein, and from it a large quantity of ore has been sent to market. It is more sulphurous than the Arendal vein, so that masses of it which have lain long exposed to the air are deeply rusted from the oxidation of the pyrites it contains. Lumps of some pounds weight of yellow pyrites may occasionally be found in it, but for the most part a little selection will avoid any injurious quantity of sulphur, or more than can be got rid of in the metallurgical treatment without serious injury to the pig. The "Dannemora vein" is another well-marked deposit beneath the Dodge or Arendal vein, upon which, as yet, but little work has been done.

Other magnetite deposits exist upon this property, which have as yet had no exploration. They are in the unexplored depths of the grand primeval forests which still cover this isolated region, with such a supply of hard-wood timber as exists nowhere else in the State of New York. The speaker mentioned, in this connection, two such localities—the Tooley Lake bed and the Sheridan vein—distant respectively about seven and two and a-half miles from the Dodge opening. The ore comes to the surface in a very wet, moss-covered region. The only indication of its presence was the occurrence of boulders carrying black hornblende, brown garnet, black mica, and pyrites, mingled in masses of calcite. These the prospectors have learned to know as sure indications that magnetite is not far distant, and to these indicis they trust more than to the dip compass. A surface sample of the Tooley Lake bed gave the following analysis:

Tooley Lake (new discovery.)		Equivalent to	
Magnetic Oxide of Iron	75.01	Metallic Iron	54.32
Oxide of Manganese	0.42	Metallic Manganese	0.29
Sulphur	0.06	Phosphorus	0.01
Phosphoric Acid	0.03	Sulphur	0.06
Silicic Acid	13.34		

The Sheridan vein has been opened many years since by some unknown prospector, and a pit sunk in it which may correspond to the removal of 15 or 20 tons of ore. The ruins of the cabin occupied by the unknown adventurers, now fallen into decay, may still be seen, and a small quantity of the ore remains stacked up for removal. The pit was full of water, but the fissure appeared to be about five feet wide. The magnetite breaks in distinct rhombic masses, and is quite free from pyrites. Biotite and lime-iron garnet are the mineral associates. The analysis is as follows:

Sheridan Vein (new discovery).		Equivalent to	
Magnetic Oxide of Iron	79.83	Metallic Iron	57.81
Oxide of Manganese	0.72	Metallic Manganese	0.50
Sulphur	0.41	Phosphorus	trace
Phosphoric Acid	trace	Sulphur	0.41
Silicic Acid	8.55		

Prof. SILLIMAN remarked, in view of these analyses and of the general mineralogy of the district, upon the total absence of *titanic acid* in these o: and also the absence of *apatite*, in the limestones, which are quite similar in appearance to those limestones of Northern New York, which elsewhere abound in phosphate of lime.

These circumstances have an important bearing upon the commercial value of the ores of this estate.

Prof. SILLIMAN confirmed the statements of Major BROOKS respecting the use of the magnetic dip compass, which is often a complete puzzle to the most experienced observer. For example, near the Sheridan vein its indications were so feeble that this important deposit could never have been discovered by it, and the same is true of the bed near Tooley Lake. In both these cases the mineralogical, and not the magnetic, phenomena were the only safe guide. On the other hand, we were able, by the aid of the dip compass, to run a line over the Dodge hill beyond the point of exploration, and to stake out the course of the ore in a direction different to that which was previously believed to be its direction. In careful and experienced hands, it is no doubt a useful and important companion, but by no means a very safe guide in many cases.

The projected Adirondack railroad from Saratoga to the St. Lawrence river passes through the Clifton estate, and will open a market in both directions for its ores.

The American Institute of Mining Engineers.

BOSTON MEETING.

SECOND SESSION—WEDNESDAY MORNING, FEBRUARY 19, 1873.

(*Continued from page* 152.)

The meeting was called to order by President RAYMOND, who made several announcements on behalf of the Council, including the names of persons recommended for election as members or associates. (Names already given in our columns.) The President also read a proposed amendment to the Rules, for the information of members. This amendment not being offered by the Council, or supported by anybody, and not being subject to any action until the May meeting, was merely read as a notice that something of the kind would come up at the annual meeting. It proposes a regular rotation in the Council instead of the present provision which throws out three members every year according to the frequency with which they have attended Council meetings.

The PRESIDENT—I find by experience, that it is not a fair test to apply to a member's interest in the meetings or his value as a member of the Council, whether he does or does not attend all the meetings. The meetings are held here and there, according to circumstances, and sometimes a manager who has a vital interest, and is very valuable, one who can give advice or suggestion by letter when he cannot be present, would come under the operation of this rule, the application of which may throw out some of our best counsellors. This subject will come up at the next meeting; and I trust it will be satisfactorily arranged so that we shall have no difficulty from this score in the future; for of all the unprofitable business in which a scientific body can be engaged, that of tinkering its rules and constitution is, in my opinion, the most unprofitable.

A paper by Mr. OSWALD J. HEINRICH was then read (in the absence of the author) on

THE MIDLOTHIAN COAL MINES.

This paper, published in full last week, describes the extraction of coal from the Midlothian Colliery in Chesterfield Co., Virginia, after it had been on fire for fifty years, and while the fire still continued.

Prof. ALFRED ROCKWELL—If much of the coal-bed had so steep a dip as 75°, I do not see how the longwall system could be applied to it. The longwall method, as I remember to have seen it abroad, can be used on beds 20 to 30 feet thick, when they are nearly horizontal, so as to take out the whole thickness at the first working, leaving a few large pillars, what is called side-work. According to modifications recently adopted in South Staffordshire, the bed is worked in two or three "leads," taking off the upper part of it as a separate bed, allowing the roof to fall, and letting it rest for two or three years, and then working the

lower half of it, the broken-down roof resting upon the top of the lower part, forming a sufficiently good roof, provided a foot or two of coal or slate be left below it. The benefit of that modification was sufficiently evident. In the best mines which I saw, this method was shown to me by Mr. HADLEY, who was the Government Inspector of the District of Devonshire. He spoke of this as an entirely safe and economical way. The report by the Government Inspector of the loss of life by the old method was terrible. Out of one thousand miners, in the course of a year, some fifty or one hundred would lose their lives. They certainly were frightful places to go into—those chambers where the falling of the roof was constantly occurring.

The PRESIDENT—My impression, from the paper, is that Mr. HEINRICH simply employed a wise modification of pillar-work—that is, instead of taking out as much as they used to take out, he has made his pillars larger. This is common sense; if you leave large pillars, they will hold until you can rob them. In regard to the Staffordshire system, I do not understand him as saying it had been employed in this particular mine. In his general remarks on the Richmond basin, he says the two methods have been tried. We shall, perhaps, get from him a supplementary communication on these points. The present paper was prepared at my suggestion, in reference to the question of fighting fire, and not in reference to the method of extracting coal. No doubt, he will have no objection to explaining the method more in detail to our satisfaction. We must all agree that a great deal of pluck and ingenuity has been shown in the attack of such a problem, and the way in which it has been so successfully solved. It is a good thing for us to know that we need not leave a mine because it is on fire.

Mr. H. M. HOWE, of Troy—In the Bessemer Works, I have measured a temperature, with men at work five minutes at a time, of 255°, and men were at work for 15 or 20 seconds at a temperature of 327°.

Mr. FIRMSTONE—If you have a thick overcoat on, and your hands and face are protected, you can go into places of that kind. I have gone under arches that were very hot, and remained three or four seconds—going in and crouching down with an overcoat on and good thick clothes, when the iron would be red hot over my head. Of course no man could work there. I went in to see if men could work there, and was satisfied that they could not.

The PRESIDENT—My experience corroborates what has been said about the possibility of enduring very severe radiating temperature, where the skin was protected and the face averted from the radiating surface.

The temperature in the Crown Point mine (at its 1,300 level, 1,900 feet below the highest point of the Comstock lode) has been as high as 128° Fahrenheit. That was due to thermal water in the rock. I know the water that dropped from the roof gave me a scalding sensation through my woolen shirt. This was in a blind drift, run for an air connection; the great heat was not the ordinary temperature of the mine. The heat rapidly declined after the air connection was established, and some degree of ventilation was obtained, although very imperfectly. The men who were obliged to carry forward that drift were supplied with air by a tin pipe, through which it was forced by a fan. The result was, that at the working face of the drift the air was not so bad as elsewhere. It was very hot, because there was a good deal of radiated heat; but if you put your face within six or eight inches of the pipe, you could get cool air, while a few feet off the air was banked up, and when you got half way into it you met a volume of heated air coming out like a flood, driven out by the fresh air. It was almost intolerable, not so much to the skin as to the lungs. The moisture of perspiration protected the skin, but the lungs, so to speak, could not perspire.

The men worked in that temperature a very few minutes at a time. They were naked, or nearly so, and ran into the drift and worked at the end of it until overpowered. Old hands did not really faint away, but new hands frequently did. They took men that had been in the mine a good while, and promoted them by degrees to the hottest place. They perspired enormously, and I presume the perspiration weakened them as much as work. They would rush out of this drift into the main drift outside, where there was more air, and there, after sometimes washing themselves, and especially wiping off the perspiration, they remained a short time—not long enough to be chilled—before returning to work.

I think the lower stopes generally had a temperature near 90°. The trouble to me in the stopes was not the heat, but the foulness of the air, from animal exhalation and candle smoke. I did not detect anything like sulphurous acid, or products of mineral decomposition.

The sensation produced was nausea. I have no doubt that the ventilation could be much improved in such mines, even without tunnels, though these would be very effective. The air-courses are often unnecessarily small and *irregular*. We may have a large passage for air a part of the way in; but if we stop the air by making it go through a small hole, we neutralize the advantage.

Prof. ROCKWELL: I remember one mine in Cornwall, where the greatest temperature was about 120° at the time I was there. The level, while I was there, was about 105° to 106°. The men worked, almost naked, for only about fifteen minutes. They could only work that length of time, and would then come back to the foot of the shaft, where the temperature was 90°, and cool off. There was an abundance of water, which appeared to cool the rocks some. The heat seemed to be due to decomposition going on in the rocks, and the water flowing along the level would almost scald the feet.

Mr. RAYMOND: The expression used by Professor ROCKWELL about "cool ing off" at 90°, suggests the important principle that our sensations of heat are relative. We have no such apparatus for the determination of heat as we have for the determination of color, or the pitch of sounds. It is only the changes of temperature that produce any impression, and therefore it is quite possible for us, as Professor ROCKWELL has said, after being in a hotter place, to go and cool off at 90°.

The first sensation of extreme heat and cold are the same. The secondary sensation must come very quickly.

Prof. SILLIMAN then read a paper on

THE PROBABLE OCCURRENCE OF DIAMONDS IN CALIFORNIA.

This paper is given in another column.

The PRESIDENT: I have never come across any platinum in traveling through the districts of Oregon; neither in the various districts of the Rogue River country, and Jackson County; nor from coast diggings, where gold is apparently washed up by the sea on the coast, near Humboldt Bay, etc. Of late years there seems to be no platinum coming from there.

A member inquired if the sand alluded to in the paper was abundant.

Prof. SILLIMAN: I cannot say. I have written to Mr. TREADWELL to inform me on this point. If it is abundant in a commercial sense there may be a value to the diamonds and zircons. But the mass which was presented to me came by mail, and was very largely composed of zircon. Taking out the ilmenite and chromic iron, I should say that two-thirds of the mass would be distinct crystals of zircon; but they were very small.

Prof. BLAKE: In a part of North Carolina white sand is very abundant by the roadside; and, after a shower, you will find stones coated with a glittering pellicle, or surface of white sand, instead of black sand. You find the black sand, also, in the country. I have examined it, and found it to be composed of well formed crystals of zircon, and often rounded by attrition and friction so as to give round grains with faces very much like diamonds. I bought one and paid a dollar for it, and thought it was a diamond. These were very small, not the size of an ordinary bird shot. They seem to be broken crystals—broken by attrition.

In reply to a question, Prof. SILLIMAN said: The latest experience with the zircon light is the discovery that a jet of oxygen, properly employed, produced the high luminous effects, without any of the inconveniences, of the cylinder.

Prof. BLAKE: I have observed only one instance of any beryls being found in California. In 1857 samples were brought to me.

Prof. SILLIMAN then made a communication on

THE MAGNETITES OF CLIFTON, ST. LAWRENCE COUNTY, N. Y.

His remarks are given in another column.

Mr. FRANK FIRMSTONE: In respect to the analysis of pig iron, I observe that what you call "close-grain pig" contains twice as much silicon as open-grain pig. Did you have any means of ascertaining the nature of the face or surface of the pig? Was the surface of the pig smooth or honeycombed?

Prof. SILLIMAN: I can recollect that they were both rusty, and had been exposed so long—four or five years—to the action of the air, that I did not set much importance upon their external appearance. I supposed the excess of silicon was due to the flux employed—a highly siliceous limestone. There was a large stack of it lying by. They had dug over and used the best portion of it, and I concluded the silicon came in that way.

Mr. FIRMSTONE: It is to be observed, that, according to the writers, the proportion of silicon decreases as the iron passes from very gray towards white; but there is apparently an exception to that rule in what is known as "silver gray iron," and in commerce as "carbonized iron." It is never made intentionally, because its properties render it almost useless. Sometimes in blowing in the furnace, it works lighter than we expect, and we make twenty to thirty tons of that iron, which remains to ornament the stock yard for years. The grain is very fine. I have seen cases in which the color was pure white. It is to be distinguished from true mottled iron by the surface of the pig, which is smooth and free from honeycombs and fibres. That is not the case in gray forge and mottled iron. It resembles No. 1 iron in the fact that the pigs are always very clean. The sand never sticks to the outside; and they have a perfectly smooth surface. It is exceedingly easy to break a pig. They will break as easily as white iron. And I am inclined to think the specimen you called close-grain gray pig is something of that kind.

Prof. SILLIMAN: Have you any analyses of that iron?

Mr. FIRMSTONE: Only analyses made under other names; but it is known to experienced furnace-men. I have known people to buy it for white iron, though its properties are the reverse of white iron. A great many mistakes in books on metallurgy are undoubtedly founded on the same blunder of confounding the two kinds of iron. It contains generally more carbon, and notably a large percentage of silicon, two or three times as much as the good gray iron made from the same ore; and its properties are supposed to be due to the silicon. It is very weak and tender; will break, as I have said, like a pig of white iron; but it is not resonant like white iron. The grain is close. The commercial name of carbonized iron rests on the supposition that the carbon is all chemically combined in the pig. On that point I have no knowledge, and am not aware of any analysis that will touch the matter. There is so much confusion on that point that it is dangerous to say anything about it. This silver-gray iron is made in both anthracite and charcoal furnaces. It is impossible to make wrought iron out of it on account of the amount of silicon it contains.

Phosphor-Bronze for Tuyeres.

Among the radical differences in practice between the German and English iron works is the use on the Continent of bronze tuyeres, which have not made their way so generally into the English works. No one who has worked over an iron furnace will deny the importance of a variation, which to those ignorant of the subject may appear but slight. Mr. BÜTTGENBACH, manager of the Neusser Iron Works, Germany, and inventor of the wall-less blast furnace, described in our last volume, advocates in *Engineering* the use of phosphor bronze as a material for tuyeres. He has tried all kinds of tuyeres and finds that the helical form, made of bent gas pipe surrounded by cast iron is the worst. Next ranks the wrought iron box tuyere, but in this the weld often gives way in a few days, even though the tuyere has been tested by a water pressure of ten or twelve atmospheres. A fault common to both these forms is that the material—iron—is one to which the pasty materials in the furnace adhere strongly, giving great trouble whenever the tuyere must be removed. He says: "I obtained better and, in fact, thoroughly good results with bronze tuyeres, and I used them for ten years without ever again applying the tuyeres mentioned above. The bronze tuyeres form less easily a connection with the fluid metal than the iron ones, and withstand the contact with the molten iron very well. Of course they sometimes get cracked; but in that case they are easily taken out, because the bronze, even if connected with the products of the furnace, may always be removed from them with a small amount of force. We may presume that such a tuyere will sustain perhaps ten times the exposure to contact with metal and fluid slag that would be endured by an iron tuyere. If made too long, the walls of the hearth suffer; if kept short, say twenty inches, it becomes necessary with the increasing action of the fire, to renew the ramming in, and the walls of the furnace are preserved. These tuyeres are not easily damaged if well made, and if the precaution is taken to conduct the current of water (supplied through a ¾ inch pipe with at least a pressure of from 30 to 40 feet, and more if possible) directly to the front of the tuyeres, in order to prevent incrustation, though that end is not entirely obtained even by this arrangement. Such a tuyere has to be removed every six months, in order to get the incrustation out either by means of hammering or by drying the tuyere, and making it slightly red hot at the mouth, in which state cold water is poured into it, when the incrustation becomes converted to dust, and is washed away by the water; the tuyere may also be boiled with half diluted hydrochloric acid. The water is introduced through ¾ inch wrought-iron tubes (gas pipe) screwed into the bottom of the tuyere. Besides the advantages mentioned above, the bronze tuyeres are more durable, are more easily manageable, and are more uniformly circular than the iron tuyeres, which latter property is always an advantage for the furnace.

The bronze tuyeres are therefore certainly the cheapest in their application, but it appears to be no easy matter to have them cast, as it is not every brass founder who can do it satisfactorily, success depending much upon the selection of the metal and the skill of the founder; in fact the casting of tuyeres is an art, like that of casting bells. I have found that intelligent brass founders could not succeed, and even large establishments, with all their resources, have tried in vain to obtain satisfactory results. The only useful bronze tuyeres I can obtain are those from a firm at Düsseldorf, Rhenish Prussia, who have paid special attention to their production.

But even the bronze tuyeres were not perfect; they often became cracked in a manner quite inexplicable, and if they came in contact with the bed of metal from below, would tear or melt. A few years ago my attention was called to the so-called phosphor-bronze of Montefiore-Levy, and everything said about it in private and public reports, and the results obtained from the trials with this metal for artillery purposes, convinced me that the properties of this metal must offer the same advantages for tuyeres as for guns. It appeared, in fact, to offer greatly increased toughness and density, and, therefore, great resistance against change of temperature and the influence of molten masses. I ordered, consequently, several tuyeres of this metal (according to exactly the same pattern as that for the ordinary bronze tuyeres) of the chief house for this metal at Liege. The matter was taken up there with interest, but no satisfactory result could be obtained, unexpected difficulties being met with, and it being again proved that it is not everybody's business to cast tuyeres. I ordered, therefore, a sufficient quantity of the valuable metal, and forwarded it to the firm in Düsseldorf already mentioned, where some excellent tuyeres were cast from it. These tuyeres were soon taken into use, and have given me the fullest satisfaction; they have the advantage of being more tough than the tuyeres of ordinary bronze, and in cases where other tuyeres would certainly have burst, they sustained the shock without any damage being done to them. I ascertained further, that this metal does not take up so readily or so firmly the incrustations produced by the contact with the water, and, what is of great importance, the oxidation of phosphor-bronze is much more slow than that of the ordinary bronze. A tuyere of the latter metal, when used for one or two years, shows at the mouth for a length of 5 in. or 6 in. a green oxidation; it gets rough, and cannot be made bright without the use of files; it is thus evident that such a tuyere will more easily take up lumps of the molten products of the furnace than a new and smooth tuyere. The older, therefore, a tuyere of ordinary bronze, the sooner will it be damaged in case of any accident. It is, further, almost impossible to find always the correct time of cleaning the tuyeres of the inner incrustation; it is forgotten or neglected, and is thus amongst a hundred cases fifty times the cause of a loss. These disadvantages are removed by the properties of the phosphor-bronze, and I have found, after a year's use, that a tuyere of phosphor-bronze, when wiped with a piece of rag, appeared quite smooth, and had a bright metallic surface, and that it had remained entirely without incrustation.

I am convinced that an ironmaster, once using tuyeres of phsphor-bronze, will at once find out the advantages of this metal, and will never again apply other tuyeres. Every blast furnace engineer knows that the trouble of taking out one tuyere produces often more expense than the cost of all the tuyeres together of one furnace. If these eventualities can be reduced only one-fifth, the extra first cost cannot be considered any longer. Complete security will never be attained, but I am convinced that the application of the phosphor-bronze for tuyeres is already an important step toward perfection.

The Temperature of Compressed Air.

At the request of the *American Artisan*, Prof. THURSTON of the Stevens Institute has prepared a table of temperatures developed by the compression of air. This is one of the most pertinent questions of the day and we reproduce below the letter which Prof. THURSTON addressed to the *Artisan*.

Your request, dated February 3, that I should construct a table exhibiting the temperatures of air compressed from mean atmospheric density up to a limit of 100 pounds per square inch, has been complied with, and I take pleasure in forwarding, herewith, such a table.

It was desired that it should exhibit the results that would be obtained were no heat to be lost or gained by the gas, while undergoing change of density, "by either conduction, radiation, or convection." It is evident that the conditions given preclude any attempt at direct experimental determinations, since it is utterly impossible to construct apparatus absolutely impervious to heat.

A vast amount of research has, however, been directed to this subject, and investigations, both experimental and theoretical, have been made by some of the ablest men of science of both past and present time.

Nearly a hundred years ago, in 1784, LAVOISIER and LAPLACE took the first steps in this path. They were followed by CRAWFORT, GAY LUSSAC, DALTON, our countryman RUMFORD, CLEMENT, and DESORMES, HAYCRAFT, DULONG, DELAROCHE, and BERARD, and, finally, the classic researches of REGNAULT, furnished the essential experimental data, which, coupled with the eminently practical work of JOULE and MAYER, were made available for our purpose, and for other important problems in thermodynamics, through the more purely theoretical, but no less essential, labors of RANKINE, CLAUSIUS, THOMPSON and others.

Upon these experimental investigations, and the researches referred to, are based the facts embodied in the accompanying table.

It is to be carefully borne in mind, that in its use, as in applying any other known expression of a single act of natural relations, it must be expected that actual results, as obtained in practice, will only approximately conform to the given figures.

It is utterly impossible to obtain any form of apparatus which will not allow of a flow of heat into or out from the air receiver.

It is almost equally improbable that the air undergoing compression or expansion, unless specially prepared, will be, on any occasion, unmixed with a notable quantity of aqueous vapor, which, in consequence of its great capacity for heat, will modify, sensibly, the temperatures due to changes in volume of dry air.

As in all cases of the application of our knowledge of the laws of nature to the solution of practical problems, a good judgment, guided by experience, is essentially requisite.

Since all cases which may be expected to arise in engineering practice, will give results intermediate between the case which I have been requested to consider, and that in which the compression occurs under constant temperature, I have determined, and have entered in the table, the relative volumes of gas under the latter conditions.

The figures of the table have been carefully prepared, and the temperatures and volumes, as given, have, in every case, been checked by the formulæ:

$$\frac{t_2 + 461°.2}{t_1 + 461°.2} = \frac{v_1{}^{k-1}}{v_2{}^{k-1}}\ (1.);\quad \frac{v_1}{v_2} = \frac{p_2{}^{\frac{1}{k}}}{p_1{}^{\frac{1}{k}}}\ (2);\ \text{and}\ p_o v_o = p_1 v_1.\ (3)$$

The labor of preparation has been somewhat formidable, but it is hoped that no errors have been entered in the table. Very respectfully yours.

R. H. THURSTON.

STEVENS INSTITUTE OF TECHNOLOGY,
HOBOKEN, N. J., Feb. 13, 1873.

TABLE OF PRESSURES, TEMPERATURES, AND VOLUMES OF COMPRESSED AIR AND PERMANENT GASES.

One hundred cubic feet of air at atmospheric mean temperature (60 deg. Fahr.,) and pressure 14.7 lbs. per square inch) undergoes change of volume without gain or loss of heat. The resulting temperatures and volumes are entered in columns B, C, and D, and the pressures in columns A and F. An equal quantity is similarly compressed, but with its temperature maintained at 60 deg. Fahr. The resulting changes of volume are given in column E.

Temperatures are measured in Fahrenheit degrees, and are reckoned from the absolute zero in column B, and from the zero of Fahrenheit's scale in column C. Volumes are in cubic feet. Pressures are given in pounds per square inch above vacuum, in column A, and above a point fifteen pounds higher, in column F.

(CONTINUED ON PAGE 187.)

THE COAL TRADE.

NEW YORK, March 20, 1873.

A little falling off in the week's business is reported in some quarters, but in others the demand is maintained, and the lighter demand is merely a result of the high rates for freight, which makes dealers unwilling to take more than is needed for immediate consumption. The opening of navigation and the establishment of lower rates consequent upon it will undoubtedly call out the demand which appears to exist in reality, though postponed on account of the peculiar circumstances of the case. A lively business is expected for the spring, and undoubtedly with good reason. The radical changes which have been made this year in the wholesale business have made the 20th of the month the controlling rate day, and the auction sale on the 1st now takes its character entirely from the rates made by the companies ten days before, instead of acting as governor for the trade of the whole month. This month prices are maintained, and with a few exceptions, no change is made. The Pennsylvania Company has moved its distributing point to Newburg for the season, by which its tolls to New York are increased from 40 to 60 cents. It has also revised its rates in accordance, lowering the prices for Lump, Steamer, Egg and Stove 10 cents a ton, and retaining last month's price for Grate and Chestnut. This is equivalent to an advance of 10 cents on the first mentioned sizes and 20 cents on the latter. This increase is, however, not really an advance upon the current rates for coal as this company has persistently kept its prices somewhat in arrear of those made by other producers.

The Reading Company makes no change in prices. The Lehigh Coal Exchange has increased the price of Lump 25 cents and lowered the price of Stove 25 cents. Its rates now are, Lump $5.25; Broken $5.20; Egg $5.20; Stove $5.25; and Chestnut $4.60.

The Wilkesbarre Company's prices are, Lump $4.45; Steamer $4.55; Broken $4.65; Egg $4.80; Stove; $5; Chestnut $4.45. This is an advance of 15 cents on Egg, and a decrease of 35 cents on Stove.

Prices in Schuylkkill County are ascertained to have averaged $2.62 and one-fifth cents. Wages for March will therefore be 4 per cent. above basis.

Bituminous coal continues in good demand. Prices are certain to be considerably higher than last year, partly because the railroad tolls are considerably higher, and partly because the producers mean to take advantage of the advance in hard coal to reap better results this year than last. The mining companies cannot be blamed. Profit is the object of their existence, but the action of the roads in advancing tolls when their rates were already fair, is one that may introduce serious causes of disturbance into the trade. The dealers are understood to have refused to ship by canal on account of the high rate—$2.40—demanded. This makes the prices at Georgetown $4.60, at Baltimore $5, and at New York $7.40, freights from Baltimore being $2.40. Gas coals are, as we said last week, in a far from satisfactory condition. It is very difficult to obtain quotations for foreign coals, and under the present circumstances the Penn coal is the only one that can be sold at a fair return to the dealer.

We print below an extract from the annual report of the Consolidated Company which details the operations of that important organization. With the tables published in this paper, January 28, this year, the extract gives an interesting account of the coal production in the great Cumberland field.

At a meeting of coal operators in Pittsburg the secretary read the scale of prices adopted February 21st, 1873, by the Tuscarawas Valley Coal and Mining Association, as follows:

Resolved, That the price of mining coal of standard thickness (four feet), should be ninety cents per ton from February 1st to October 1st, and one dollar per ton from October 1st to February 1st. When miners are paid one dollar per ton for mining coal, to receive five cents extra for every three inches the vein is less than the four inches.

The resolution was debated at length by the members present, after which the following preamble and resolution was unanimously adopted:

"*Whereas*, the maximum price paid for mining has been (4) four cents per bushel for many years prior to last fall, at which time a number of operators were compelled to accede to a demand of an advance to (5) five cents per bushel, owing to the temporary necessity of manufacturers and consumers, and *whereas* the demand for coal, both for home and foreign trade, has since materially decreased, and *whereas* the profits of the business are so small as not to remunerate us for conducting the same when paying over (4) four cents per bushel; therefore.

Resolved, That our business be conducted with a view to fixing the standard price for mining at four cents per bushel at all mines on the railroads, thus making the price uniform with the price of mining at the river mines, commencing not later than April 1st, 1873, and that the officers of the Railroad Coal Producers' Exchange be requested to call a meeting on Tuesday next, to take definite action, and fixing the time at which the reduction shall take place.

Report of the Consolidation Coal Company.

The Annual Report of the Consolidation Coal Company gives some particulars of general interest, from which we extract the following:

THE MINING INTEREST.

The most perfect and reliable Report upon the coal properties of the Cumberland Basin in Alleghany County, Maryland, is that made by Professor HODGE, in 1869, at the request of several of the leading companies, which then had in view a general consolidation of interests. This accomplished geological engineer (since deceased) made a very thorough examination, and his impartial statements as to the number of acres belonging to each company, the facilities of each for mining, the distances from Cumberland and Piedmont, the points of shipment on the Chesapeake and Ohio Canal, and Baltimore and Ohio Railroad, afford a safe guide for estimates of quantities, distance, cost of transportation, and comparative values.

The Cumberland Basin has one great vein of coal (from ten to fifteen feet in thickness) and some smaller veins, situated at a greater depth below the surface. The great vein, however, from its magnitude, favorable position for working, and freedom from impurities, is alone taken into account when estimating the value of this coal-field, either at the present time or for two or three generations to come. The smaller seams, varying from four to six feet in thickness, can be reached at one-quarter the depth of many mines now worked in England, and may, at some future day, be made available and profitable.

According to Prof. HODGE, there were in the whole basin 14,757 acres of the great vein then remaining. Making allowance for the amount since worked out, the following table will show the number of acres owned by the principal companies, and the average distances from Cumberland and Piedmont; Cumberland being situated on the Baltimore and Ohio Railroad, and at the head of navigation of the Chesapeake and Ohio Canal, and Piedmont being the Western terminus of our railroad, also on the Baltimore and Ohio Road, twenty-eight miles west of Cumberland:

TABLE OF PROPERTIES CONTAINING THE GREAT COAL VEIN OF THE CUMBERLAND BASIN.

COMPANY.	Acres of Big Vein Coal Lands unworked.	DISTANCE FROM CUMBERLAND. Miles.	DISTANCE FROM PIEDMONT. Miles.
Consolidation (five mines)	8,080	12—19—22	.....
Borden (two mines)	450	15—19	.....
Maryland (two mines)	950	26	8
American (two mines)	800	26—29	8
New Central, organized since Professor Hodge's Report, and consisting of Koontz, Big Vein, Midlothian and Johnson	800	20—29	14—9
George's Creek Coal and Iron	1,300	25	9
Hampshire and Baltimore (also lesser vein in Virginia) worked, but quantity unknown	100	23	11
Franklin	125	32½	1
Barton	125	29	5
George's Creek Mining	125	31½	2
Remainder made up of several small scattered properties, say	1,225		
	14,000		

Allowing only for the ratio of increase as presented by these tables, it is evident that, within a very brief period, the large property of this company, so favorably situated as regards proximity to market, must be greatly enhanced in value. But, from the extraordinary state of things in England, the rise in price of coal there, the growing demand for our coal in this country for use of steamships and railroads, and for the manufacture of steel and iron in various forms, it is not only probable, but certain, that the demand for Cumberland coal will be much increased. Hitherto there has generally been a supply from this coal-field in excess of the demand, and this has led to competition between the producers, seriously affecting their profits. Hence, we have every reason for the coming and future years to count upon more adequate return for labor employed and capital invested.

The capacity of the present mines is 2,500 tons per day, or 750,000 tons a year. Possibly this amount may be somewhat exceeded. By extending the present openings and making new ones at points favorable for the purpose, the annual production can be largely augmented. Of course this will involve a moderate outlay, and will only be undertaken as warranted by increasing demand.

Within the past year the experiment has been made of substituting, in one of the mines, a small locomotive engine for the horse power heretofore employed, which has proved very successful and economical. It was found especially so when the horse distemper, which seems to have pervaded the whole country, reached the mining district.

Another small locomotive has been ordered for the Hoffman and Astor mines, to be delivered in March next. At these mines there is now a long haul by horse power. The proposed change will reduce this expense, and also dispense with a stationary engine. The small locomotive and under-ground rails will cost nearly $12,000; but this will be reimbursed by more than two miles of old rails to be taken up on the Astor branch, and by the value of the stationary engine, so that no absolute expense will be incurred, while the saving in working expenses is estimated at $100 per day, or say $25,000 for the year.

The company owns 57 miles of railroad, connecting its properties with the Pennsylvania Central and Baltimore and Ohio Roads. The main line is being laid with steel rails, steel headed rails not having turned out well.

The great lines connecting with our road, and through which Cumberland coal reaches tidewater, are the Chesapeake and Ohio Canal and the Baltimore and Ohio Railroad, the distance in each case being about 180 miles.

In October last a third avenue was opened by way of the Pennsylvania Railroad, making an all-rail route direct to New York or South Amboy, the distance being about 350 miles. A branch of three miles was built by the Consolidation Coal Company to complete this connection. We were promised that this route would be opened early in the year 1872, but it was not until the middle of October that transportation was commenced, and since that date, from scarcity of rolling stock on the Pennsylvania lines, and the severity of the winter, only a small amount of coal has yet been transported by this route. This, however, is but a temporary disappointment, and during the current year we are assured that much better results will be attained. Besides the advantage of another through line, this new route opens a way for the supply of our coal to the manufacturing districts of Pennsylvania. A limited quantity has been thus shipped, and a decided preference is given by consumers to the Cumberland over the Bituminous coals of Pennsylvania. With reasonable rates of transportation, this business will become quite important to our interests.

Thus three great lines now connect the Cumberland coal-field with tidewater. The canal is in good condition, and very little interruption to navigation occured during the past year from floods or injury to the works. It is, however, closed about three months each year during the winter season. The Baltimore and Ohio Railroad carries promptly vast quantities of coal, and there is to be a large addition of engines and cars in anticipation of an increased tonnage.

The President recommends the construction of a fleet of steam colliers, either by the company or by a special company acting under an arrangement for the transportation of coal. He anticipates a considerable yearly increase of sales, and points to the position of the coal trade abroad, and to the new connection with the Pennsylvania road as causes which may be expected to operate in the company's favor.

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, March 15, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	12,774 06	130,30? 09
Shipped South	46,10? 01	392,338 14
Total	5 ,875 07	522,646 03
For the Corresponding time last Year:		
Shipped North	11,443 17	126,030 09
Shipped South	38,722 02	406,040 10
Total	50,165 19	542,070 19
Increase	8,709 08	
Decrease	.....	19,422 16

Anthracite Coal Trade for 1873 and 1872.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending March 15, 1873, compared with the week ending March 16, 1872.

COMPANIES.	1873. WEEK.	1873. TOTAL.	1872. WEEK.	1872. TOTAL.
*Phila & Reading R.Rt..	79,927	818,391	103,374	930,639
*Schuylkill Canal.....	....	13,356	....	6,594
*Lehigh Valley R. R. ..	60,184	776,078	69,161	761,539
Lehigh & Sus. R. R.....	35,207	275,790	53,689	392,749
" "	....	....	....	....
Scranton North.....	11,444	126,050	12,774	130,309
" South	38,722	406,040	46,101	392,339
Penn. Coal Co., rail.....	19,387	188,573	27,728	154,084
" " canal....	....	....	....	....
Del. & Hud. Canal Co....	....	....	....	....
" " East...	16,082	119,981	9,634	69,220
" " West..	5,876	77,923	8,910	87,169
" " South.	5,638	69,751	5,783	65,115
Shamokin.....	7,940	87,117	14,126	102,758
Tiersorton.....	....	....	....	....
Lykens Valley Coal Co....	....	....	....	....
Wyoming North.....	....	....	....	....
Wyoming South.....	....	....	....	....
P. N. Y. C. & R. R. Co..	....	141,460	17,587	126,324
Williamstown Co'y.....	....	.....	....	....
Big Lick Col....	....	.....	....	....
Total..	280,457	3,100,180	364,568	3,747,839
1870.....			280,467	3,100,180
Increase			84,401	147,659
Decrease.....				

These figures are for the week and fiscal period commencing Nov. 30.

† Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1873 and 1873.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending March 15, 1873, compared with week ending March 16, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873 Week.	1873 Year.
C. & O. Canal.....	193	414	....	....
B. & O. R. R.....	19,280	200,075	28,970	236,095
Penn. S. Line.....	.....	.....	1,796	19,194
H. & B. T. R. R.....	5,300	52,908	8,554	81,388
*Harrisburg & D.....	10,310	117,802	6,777	76,326
*L. V. R. R....	7.0	8,413	149	6,827
P. & N.Y.C. & R. Co.....	6,233	81,710	6,305	62,023
{Cumberl'd Branch Canal	....	....	....	....
" Railroad....	....	290	2,391	23,404
Total.....	42,046	461,612	54,942	505,257
			42,046	461,612
Decrease.....				
Increase			11,896	43,645

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending March 15—Compared with same time last year.

WHERE SHIPPED FROM	THIS. tons ct.	LOCAL. tons ct.	TL. WEEK tons cwt.	TL. DATE. tons.cwt.
Wyoming Region . .	24921 03	12835 15	37756 18	306648 11
Upper Lehigh Region .		4453 02	4453 02	4 548 09
Beaver Meadow Region	2681 02	2583 13	5264 15	38313 09
Hazleton Region . . .		507 13	507 13	3316 10
Mauch Chunk Region .	7439 00	4656 12	12096 12	7949 05
Trescaow Region.....				
Mahanoy Region . .				
Total . . .	35041 05	25006 15	60048 00	466318 04
Previously reported	203332 08	204937 16	408270 04	
Total to date . .	238373 13	227944 11	466318 04	
Same time last year	185977 15	148741 00	334718 15	
Increase . .	52395 18	79203 11	131599 09	
Decrease . . .				

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points . .	35041 05	23935 18	236373 13	185977 15
Forwarded East by Rail to Local points . .	11945 13	7157 02	105876 13	67857 00
Forwarded East by Rail use Central Division	1670 11	2247 15	18076 10	16047 01
Forwarded East by Rail use L. & S. . . .	360 16	192 10	2773 07	1835 00
Delivered at and above Mauch Chunk . .	1630 02	1565 01	17674 11	11874 09
Delivered at Coalport & Hazard for Canal .	631 14	1866 11	11298 13	5908 02
Delivered to L. V. R.R. at Packerton	1607 06	440 00	9743 04	3537 19
Delivered to L. V. R. R. at Sugar Notch .	4400 03		19123 10	
Delivered to L. & B. R. R.at PlymouthBridge	3360 10	3282 06	466318 04	41681 09
Total . . .	60048 00	40687 03	4693:8 04	334718 15

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, March 15, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal.....	....	....
By Railroad, East.....	9,634	69,220
" West.....	8 910	87,169
" South	5,783	65,115
Total 1873.....	24,327	221,504
Corresponding time in 1872 :		
By Delaware and Hudson Canal.....	....	....
By Railroad, East.....	16,082	119,681
" West.....	5,876	79,923
" South.....	5,698	69,751
Total.....	27,656	269,353
Decrease.....	47,851	

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending March 15, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway.....	22.728 06	154,084 10	19,387 00	187,572 15
" Canal.....	....	.....	.....	.....
Total	.....	....	....	.....
Decrease 1873..	33,488 05			

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, March 15, 1873.
BY RAILROAD—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair.	31,370	01
" Port Carbon.	6,495	05
" Pottsville.	2,815	01
" Schuylkill Haven.	27,667	01
" Pine Grove.	5,587	16
" Tamaqua.	13,167	05
" Harrisburg.		
" Dauphin.	3,266	16
Total	90,169	06

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	
" Mill Creek "	
" Schuylkill Valley Scales	
" Mt. Carbon "	
" Cressona "	
" Pine Grove "	
" Tamaqua "	
Total	

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	316 18
" N. C. R. R. passing Locust Gap.	173 06
" " " Shamokin.	4,809 03
" " " Herndon.	....
Total	5,298 07

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,736 16
" Lebanon & Pine Grove Branch	780 19
Total	2,517 15

CONSUMED ON LATERALS.

From Frackville Scales.	392 16
" Mill Creek "	536 03
" Schuylkill Valley Scales.	1,195 07
" Mt. Carbon "	1,051 02
" Cressona "	420 06
" Pine Grove "	39 08
" Tamaqua "	315 14
Total	3,950 16

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East		4,812 15
	Cat. & Wpt. Br. Sent West	.....
" "	Rupert, Cat. & Wpt. Br.	126 19
" "	Allentown, E. Penn'a br.	.....
" "	Alburtis, " "	.....
" "	Oreland, G. & N. Br.	1,675 14
" "	Connecting R. R.	.....
" "	Willow Street R. R.	821 10
Total		7,436 18

BITUMINOUS.

From Harrisburg.	6,766 17
" Connecting R. R., G. & N. Br.	
" Junction R. R.	10 00
Total	6,776 17

COAL FOR COMPANY'S USE.

Anthracite	9,014 06
Bituminous	397 15
Total.	9,412 01

RECAPITULATION.

	Total for Week.	Corres-p'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	90,169 06	65,340 02	i 24,829 04
For Shipment by Canal		2,280 06	d 2,280 06
Shipped Westward via Northern Central R. R.	5,299 07	4,687 18	i 611 09
Shipped West or South from Pine Grove	2,517 15	1,834 09	i 683 06
Consumed on Laterals	3,950 16	4,011 18	d 61 02
Lehigh and Wyoming Coal	7,436 18	1,772 13	i 5,664 05
Total Anthracite paying freig't	109,374 02	79,927 06	i 29,446 16
Bituminous	6,776 17	10,310 12	d 3,533 15
Total of all kinds paying freig't	113,150 19	90,238 18	i 25,913 01
Coal for Company's use	9,412 01	5,035 10	i 4,376 11
Total Tonnage for Week	125,563 07	95,273 08	i 30,289 12
Previously this year	1003651 08	975,095 15	i 28,555 13
Total to date	1129224 08	1070369 03	i 58,855 06

SHIPPED BY CANAL.

From Schuylkill Haven			
" Port Clinton			
Total Tonnage per Week			
Previously this year			
Total to date	6,594 00	13,355 16	d 6,761 16

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days, ending March 14, 1873.

	Tons.	Cwt.
East	1,785	05
West	12,341	06
	14,126	11
Same time last year	7,939	12
Increase	6,186	19
Decrease	.....	
Total amount shipped to date	102,757	11
Same time last year	76,117	11
Increase	26,640	00
Decrease		

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, March 15, 1873.

	WEEK.	SEASON.
North	57,023 04	489,007 03
South	5,783 06	65,114 14
Total 1873	62,806 10	554,121 17
Corresponding time in 1872 :		
North	47,082 06	502,559 12
South	5 698 09	69,750 06
Total	52,780 15	572,310 14
Increase North		
Decrease North		
Increase South		
Decrease South		
Increase	10,255 15	
Decrease		18,188 09

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending March 15, 1872.

	Week. Tons.	Cwt.	Total. Tons.	Cwt.
Anthracite received :				
From Lehigh Valley R. R.	8,040	06	96,110	19
" Lack. & B. R. R.	1,049	01	8,049	08
" Pleasant Valley R. R.	2,627	19	40,939	07
" Sul. & Erie R. R.	896	12	10,224	12
Total	12,586	18	155,324	06
Same time last year	9,879	16	141,450	07
Increase	2,707	02	13,873	19
Decrease				
Distributed :				
To Lehigh Valley R. R.	275	17	9,838	18
To Lack. & B. R. R.	22	09	257	00
To S. Central R. R.	3,002	11	33,555	12
To Ithaca & A. R. R.	1,912	08	24,129	05
To Erie R. W. Pockets for shipm't.	4,378	09	45,774	09
To individuals on line of road	641	18	13,865	17
To points at & above Coxton for use of Co.	646	16	7,872	18
To points between Waverley and Elmira	1,206	10	20,018	07
Total	12,586	18	155,324	06
Bituminous received from BARCLAY R. R.				
Shipped north from Towanda	6,139	13	62,516	03
Shipped south from Towanda	165	13	507	00
Northern Central R. R.	....		.....	
Total	6,305	06	63,023	03
Same time last year	6,233	08	81,709	15
Increase				
Decrease	71	18	18,686	13
Distributed :				
To Erie Railway	5,277	01	52,240	07
To So. Central R. R	862	12	10,169	11
To Ithaca Valley R. R.	....		71	03
Lehigh Valley, R. R.	71	19	297	09
To individuals on line of Railroad.	30	00	139	02
To points on line of road for use of Company	63	14	105	06
Total	6,305	06	63,123	03
Grand totals transported				
Anthracite	12,586	18	155,324	06
Bituminous	6,305	06	63,023	03
Total	18,892	04	218,347	09
Same time last year	16,113	04	218,160	03
Increase	2,779	00	4,812	14
Decrease				

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday March, 15, andduring the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l. Tons. Cwt	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons. Cwt	Total. Tons. Cwt.
1873.....	—	24,969 15	1,795 13	30,765 28
1872.....	193 06	19,279 14	....	19,473 00
Increase....		9,690 01	1,795 13	11,292 08
Decrease	193 06	.....	....	

YEAR.

1873.....	—	236,094 15	19,194 05	255,288 00
1872.....	413 16	200,075 10	....	200,489 06
Increase.....	....	36,019 05	19,194 05	54,799 14
Decrease.....	413 16	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To P. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873.....	—	2,390 16	2,390 16
1872.....	—	.....	.....
Increase.....	—	2,390 16	2,390 16
Decrease.....	.....	.....	.....

YEAR.

1873.....		23,404 09	23,404 09
1872.....		290 10	290 10
Increase		23,113 19	23,113 19
Decrease			

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending March 15, 1873, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	15,930 16	180,417 16
" Hazleton	40,534 16	457,733 00
" Upper Lehigh	149 17	1,364 18
" Beaver Meadow	13,125 11	170,759 05
" Mahanoy	10,602 01	93 580 19
" Mauch Chunk	224 09	1,350 11
Total.	80,567 10	905,186 09
Same time last year	70,456 05	896,110 12
Increase	10,409 05	8,075 17
Decrease		
Forwarded East from Mauch Chunk by rail	69,160 16	761,838 13
Same time last year	60,183 16	776,078 02
Increase	8,977 00	
Decrease		14,539 09

DISTRIBUTED AS FOLLOWS.

Forwarded East from Mauch Chunk by rail	67,743 04	743,838 14
do East for use L. V. R. R.	1,417 12	18,000 19
Delivered at and above Mauch Chunk for use of L. V. R.R.	1,693 03	19,943 11
To P. & N. Y. R. R.	8,040 06	96,110 19
To N. C. R. R., at Mount Carmel	.....	2,691 02
To D. H. & W. R. R.	1,129 19	12,471 16
To L. & S. R. R. at Packerton for rail	360 15	4,310 08
Delivered at M'h Chunk	29 04	1,285 10
Delivered on line of road above Mauch Chunk	378 10	5,153 14
To L. & S. R. R., at Penn Hav., for railroad		1,541 10
Do. for canal		
To Lehigh Canal Mauch Chunk		
To Catawissa Railroad		25 00
To L. & B. R. R. at Lack. Junc.	74 17	104 06
Total	80,567 10	905,186 09

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. March 20.		AT PHILADELPHIA. March 20.	
SCHUYLKILL.	R. A.	W. A	R. A.	W. A.
Lump	$— —	$5 35	— —	4 00
Steamer	— —	5 35	— —	4 00
Broken	5 60	5 35	4 25	4 00
Egg	5 75	5 50	4 40	4 15
Stove	5 95	5 65	4 60	4 30
Chestnut	5 10	5 35	3 75	3 50
Pea	— —	— —	— —	— —
LEHIGH.				
Freight to New York 50 cents.				
Lump, (on board)	— —	5 25	— —	— —
Broken	— —	5 20	— —	— —
Egg	— —	5 20	— —	— —
Stove	— —	5 60	— —	— —
Chestnut	— —	4 25	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Honey Brook, Le'h W.A.	4 60@5 50		— —	— —
Spring Mountain " "	— —@— —		— —	— —
Sugar Loaf " "	— —@— —		— —	— —
Old Comp'y's " "	4 60@5 50		— —	— —
Room Run " "	4 60@5 50		— —	— —
Hill & Harris " "	4 60@5 50		— —	— —
Shamokin " "	4 60@5 50		— —	— —
Lykens Valley " "	4 75@6 00		— —	— —
Broad Top " "	6 50@— 00		5 25	— —

Company Coals.

March, 1873.

	L.	Str.	Ora.	Eg.	Sto.	Chest
*Scranton at E. Port	4 25	4 25	4 45	4 65	5 50	4 25
Pittston at Weehawken	4 70	4 70	4 70	4 90	5 40	4 60
*Lackawana at Weehawken	4 60	4 70	4 80	5 05	5 50	4 60
Wilk'b're at Hoboken	4 45	4 55	4 65	4 65	5 35	4 45
Old Co. Lehigh at Pt. John'n	5 25	—	4 85	4 90	5 15	4 15
Lehigh at Eliz. Port	5 00	—	4 75	4 75	5 10	4 15

For freights to different points see "Freights."
*To contractors only.

Prices at Baltimore—March, 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 75@6 00
Pittston and Plymouth, do	5 75@....
Shamokin Red or White Ash, do	6 00@6 25
Lykens Valley Red Ash, do	...@6 50
By retail, all kinds per ton of 2,240 lbs	7 50@8 50
George's Creek and Cumberland f. o. b. at Locust Point for cargoes	....@5 00
Fairmont and Clarksburg gas f. o. b. at L. Point	6 40
Kanawha Cannel, coarse	@12 00

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	....
Consolidation Coal Co.'s on board at Baltimore	....
Maryland Coal Co " "	....

Prices at Georgetown, D.C., and Alexandria, Va.

March, 1873.

George's Creek and Cumberland f. o. b. for shipping $....@.... [nominally.

No coal before spring.

Prices at Havre de Grace, Md.

March, 1873.

Wilkesbarre and other White Ash for Cargoes	$ @4 75
Lykens Valley	@5 75
Shamokin Red or White Ash	5 00

Bituminous Coals (Cumberland).

Georgetown, F.o.b	$
Baltimore "	
New York "	

Prices of Foreign Coals.

March, 1873.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

	Nominal.
Liverpool Gas Caking	15 00@16 50
" " Cannel	22 00@23 00
" House "	17 00@18 00
" Orrel	

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$21 00@22 00
"Cannel, "	23 00@25 00

Per ton 2.000 lbs. delivered.

Prices of Gas Coals.

March, 1873.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y.

	Coarse	Slack.
Block House	$2 00	$1 00
Gowrie	1 75	— 80

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal.
Pictou nett	$2 25	1 25
Sydney	2 25	- 80
Lingan	1 75	- 80
Caledonia	1 75	- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton of 28 bushels.

AMERICAN.	Nominal quo. Currency.
Westmoreland	$7 10 @— —
Fairmount Gas Coal Co. of N. Y	7 00 @— —
Despard Coal Co	7 00 @— —
Penn	7 10 @— —
Newburg Orrel Gas	— — @— —
West Fairmount Gas Coal	7 00 @— —
Redbank Cannel, Penn	— — @— —
AT PHILADELPHIA.	
Westmoreland	7 00 @— —

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven Lump and St., net, $1 60; Br., Egg and Ch., $1 65; Stove, $1 75 Shipping at Pt. R., 20c., for use at Phil., $2 18 from Pt Carbon.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$6 72
C. R. R., N. J., Phillipsburgh to Elizabethport	1 06
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 3

MAUCH CHUNK TO PORT JOHNSTON.

L. V. R.R., or L. & S. R. R. from M. C. to Phillipsb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO SOUTH AMBOY.

L. V. R. R.	72
D. & D. R. R. } Cam. & Am. R. R. }	1 06
Shipping Expenses,	25
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	0 84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 35

Foreign and Provincial Freight

March, 1873.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-2 tons £
Liverpool, 5 per cent primage

TO NEW YORK.

Provincial

Sydney	$2 65
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 10
Little Glace Bay	3 00

TO BOSTON.

Sydney	3 00
Lingan	3 00
Cow Bay	3 00
Port Caledonia	3 00
Little Glace Bay	2 90

Freights.—March, 1873.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Philada'a.	Anthracite. From Elis. Port, Port Johnston, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Rondout.
Amesbury		4 50				
Bangor		4 50		2 60		
Bath		4 00		2 40		
Boston	3 10	3 75		1 00		
Bridgeport	2 75			1 40		
Bristol						
Cohasset Narrows	2 25					
Derby	2 85					
Dighton						
East Cambridge						
Fall River	2 75	3 25		1 40		
Hackensack						
Hartford						
Hoboken	2 10	3 75		50		
Jersey City	2 10			50		
Lynn						
Middletown						
Mystic				1 50		
New Bedford	3 00	3 50		1 40		
Newburyport	3 10	4 50		2 80		
New Haven	2 75	3 25		1 00		
New London	2 75	3 75		1 20		
Newport	3 30			1 40		
New York	2 25	2 50		50		
Norwalk	2 50	3 50		1 00		
Norwich		3 75		1 45		
Pawtucket		3 50		1 60		
Portland	3 25	4 00		2 40		
Portsmouth, N. H		4 50		2 55		
Providence	2 75	3 50		1 40		
Rockport						
Saco						
Sag Harbor				1 30		
Salem	2 70	4 25		2,40		
Stamford				1 00		
Stonington				1 50		
Taunton				2 00		
Warren				1 4		
TO RIVER PORTS						
Albany						
Catskill						
Cocksackie						
Coeyman's						
Cold Spring	2 30					
Fishkill						
Haverstraw						
Hudson	3 25					
New York						
Nyack	2 25					
Poughkeepsie	2 50					
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy	3 00					
West Point						
Yonkers						

St. Thomas	$— — Gold.
Martinique	— —
Demerara	— —
New Orleans	— —
Mobile	— —

MARKET REVIEW.

NEW YORK, March 20, 1873.

IRON.—There has been considerable inquiry for Scotch Pig since our last, though buyers are loth to purchase at the present ruling rates. Importers are asking full prices, as it is impossible to lay it down here except at a cost somewhat above our quotations. A brisk business is confidently looked for on the opening of navigation, and higher prices are anticipated. At last advices from the other side, there were no sailing vessels loading for this port, and the export was confined to small lots per steamer. The only sales are 50 tons Glengarnock at $56, and a quantity of Monckland $55. American Pig is in a very quiet state, pending the resumption of navigation, but holders are generally firm at $50 for No. 1, $47 for No. 2, and Gray Forge $40 at furnace. The furnaces are not offering No. 1 to any extent, the stock of which is not large—No. 2 is more plenty, and of Gray Forge the supply is ample for present demands; sales small lots No. 2 Poughkeepsie delivered here at $47,50. American Rails are in good request, and further sales of 5000 tons have been made by an Eastern Mill at $85 f. o. b. New English are dull, and selling below cost of importation—they may be quoted nominally $70a$71 gold. Old do. are held for full figures, the asking prices being generally above the views of buyers—100 tons T. sold on private terms. Scrap has sold in small parcels at $60 from yard, but this may be considered a full figure; we note sales 75 tons old Boiler at $52; 45 do. old Cannon, and 100 do. Wrought Scrap, on terms withheld. Refined Bar &c., from store continues steady and firm at the advanced prices noted 8th inst. The English market is very strong at advancing rates.

LEAD.—Foreign Pig since our last has been quiet, but is held firmly at the improvement then noticed, say 6¼ cents gold for Ordinary. In American, there has been some further considerable business, the sales embracing 4a5000 tons at 6¼a6¾ cents gold, now held at 6¾a6¾ cents. Bar 9¼ cents, Sheet and Pipe 10½, and Tin-lined Pipe 16½, less 10 per cent. to the Trade.

COPPER.—New Sheathing is steady at 43 cents, and Bolts and Braziers 45, Bronze and Yellow Metal Sheathing 27 and Y. M. Bolts 32 net cash. Ingot Copper remains in the same position, a very limited demand for spot lots, Manufacturers purchasing as sparingly as possible, only to tide over the time between now and the opening of navigation, when their deliveries, on contracts before noticed, will be made at prices considerably below those now current; 50,000 lb. Lake sold at 34½ cents cash, and 60,000 lb. on private terms. In English, there was a much bettter feeling yesterday, cables being at hand from London advising an excited market, and prices up to £98 for English Best Selected, and £89 for Chile Bars. There have been sales here of 125 tons B. S. at 20½a30 cents, 30 days, closing firm at the latter figure.

The product of the Lake Superior Copper mines (of fine Copper) was in

1858	lb. 8,200,000	1866	lb. 14,0000,000
1859	8,400,000	1867	18,500,000
1860	12,000,000	1868	19,975,000
1861	15,000,000	1869	24,500,000
1862	12,600,000	1870	25,900,000
1863	13,000,000	1871	25,700,000
1864	13,00,0000	1872	24,256,000
1865	14,000,000		

The falling off in the yield of 1872 as owing to the labor troubles and strikes in the mining region; the ore is believed to be as abundant as ever, and quite as rich in Copper. The average product of the Tennessee mines is about 1,500,000 lb. to 1,750,000 lb., and that of the Vermont mines is about 850,000 lb. to 1,000,000 lb. The Copper smelted at Baltimore is chiefly, if not wholly, smelted from Foreign ore. We copied a paragraph some time ago from the *Mining Gazette* relative to the yield of Copper of the Lake Superior region in 1871 and 1872; the figures then given were for the Mineral as shipped from the mines to the smelting works, which Mineral averages 75a80 per cent. of pure Copper. This will explain the apparent discrepancy between that statement and the above.

SPELTER.—Since the large movement, accompanied with the rise in price, last week, the market has been quiet. We quote Silesian 7¾a8 cents gold.

TIN.—Cables from Singapore advise a further advance in Pig, now $37,50 per picul, and there continues to be a good demand here at prices still in sellers' favor; the transactions embrace about 3000 slabs Straits at 32½a33 cents, in Small lots 33½, now held at 33½a34; and 10 tons English, 33, all gold. The steamer St. Petersburg, from China and Singapore, lost off Bermuda, had 2000 Pigs on board. In Plates, there continues a considerable business at full price. The labor strikes in Wales are at end, but others are announced in other places which have a bearing on the market. One-third X Charcoal Tin, 14 by 20, and 10 by 14 are very scarce, as are also Coke Tin, 10 by 14, the latter now held at $10,75a$11. The stock of Plates generally may be said to be very light; sales have been made of 1000 bxs. Charcoal Tin, assorted, at $12; 1100 do., $12,25; 500 do. Coke Tin, 14 by 20, $10,50; 500 do., 10 by 14, $10,75; 500 do. Charcoal Terne, $10,87½; 100 do., to arrive $10,75; 1500 do., part $10,75 a$11, all gold; and 500 do. Assorted Charcoal Tin on private terms.

ZINC.—Am. oxide is quoted at 8a9; do. French 9½a9¾. Sheet 10½a11, with slight transactions. Manganese 4a5.

On the Probable Existence of Microscopic Diamonds, with Zircons and Topaz, in the Sands of Hydraulic Washings in California.

By Prof. B. SILLIMAN.*

THE occurrence of diamonds of some size in the gold fields of California is by no means uncommon, and was noticed by me in a communication to the California Academy of Science in 1867, when specimens of this gem, from at least five different localities, were exhibited. I then suggested that a more attentive examination of the heavy sands left in the sluices of hydraulic washings would in all probability detect diamonds, mingled with other rare species not commonly believed to occur in these sands.

Mr. GEORGE A. TREADWELL, of San Francisco, has lately sent me a small package of these sands, collected by him from the sluices of the "Spring Valley Gravel Mining Claim," Cherokee, Butte County, California. A microscopic examination shows these sands to abound in beautiful colorless zircons (hyacinths), of the form well-known in the hyacinths of Expailly (France), associated with crystals of topaz, quartz in fragments, rounded grains of chromic and titanic iron, and a few small, almost globular, masses of very high refracting power which appeared to be diamonds. To determine this chemically, a portion of the sands was treated with acid for the removal of any carbonates which might be present. There was no effervescence from this treatment. The same sample was then digested in strong sulphuric acid of a high temperature to destroy any particles of organic matter which might be present, washed out in pure water without contact with organic matter, dried and ignited in a vessel of platinum out of contact with air. This sample of the sands thus freed from anything which could afford carbonic acid, but the diamond, was then ignited in a platinum nacelle (boat) in a tube of hard glass, and in a current of pure dry oxygen gas, which, for precaution, was passed over soda lime, and then, after passing the ignited assay, was delivered through a solution of baryta water. The transparency of this delicate test was soon disturbed, and by continuing the experiment for about an hour, a notable quantity of baryta carbonate was obtained. This experiment seems to prove that diamond powder was present in small quantity.

It will be remembered that Prof. WÖHLER, some years since, found diamonds by a similar method in the platinum sands from Oregon, associated with the rare species *Laurite*—sulphide of osmium and ruthenium. His paper will be found in the American Supplement to the Chemical News for November, 1869, p. 317.

The black grains, which contribute fully one-half the bulk of the Butte County sands, are about equally chromic iron, which the magnet removes, and titanic iron, which is unaffected by the magnet. The chromic iron was so proved by the blowpipe, and no magnetite could be detected. No metallic grains of any of the platinum or iridosmium metals, or gold, could be found.

Under polarized light, these crystalline sands form a splendid microscopic object.

When I am provided with a larger quantity of these sands, I propose to determine the amount of diamond dust quantitatively.

In his letter to me, accompanying the sample sent, Mr. TREADWELL says: "I have examined much of the sand under the microscope, and think there are a few fragments of broken diamonds. These sands were taken from the tailings after passing through a long flume paved with stone. You know what sharp and hard pounding the gravel gets, mixed with boulders, in a hydraulic flume. No doubt, some diamonds are ground, or rather broken, by hard knocks to powder."

A more attentive observation, by a mineralogical eye, of the sands accumulating in the sluices of hydraulic washings will, no doubt, be rewarded by the discovery of many rare species, which have thus far escaped notice for want of scientific skill. To show how much may be learned from an attentive study of such sands, Dr. JOHN TORREY has informed me that in a sample of sands from gold washings in Nicaragua, he has found not less than twenty distinct mineral species, many of them of rare occurrence. No doubt, a careful examination of the sands of Oregon, where Dr. TRASK found the platinum minerals, would reveal many unsuspected species.

The Composition of Rust.

Prof. CRACE CALVERT, a distinguished English chemist, has been investigating the circumstances under which rust is formed. He found that iron rust is a much more complicated substance than is generally supposed. Two specimens—one from Conway Bridge, and the other from Llangollen, Wales—had the following composition:

	Conway Bridge.	Llangollen.
Sesquioxide of iron	92·900	93·094
Protoxide of iron	6·177	5·810
Carbonate of iron	0·617	0·605
Carbonate of lime	0·295	0·295
Silica	0·121	0·196
Ammonia	trace	trace
Total	100·000	100·000

This proves that the decomposition of water has less to do with the formation of rust than has heretofore been supposed, and that carbonic acid is the most powerful agent. This was also proved by direct experiment. Clean iron blades were exposed in glass tubes to the action of various gases, wet and dry. Under these circumstances, pure and dry oxygen does not determine the oxidation of iron; moist oxygen has only a feeble action; dry or moist pure carbonic acid has no action, while oxygen containing traces of carbonic acid acts most rapidly on iron, giving rise to protoxide of iron, then to carbonate of the same oxide, and lastly to a mixture of saline oxide and hydrate of sesquioxide. Carbonic acid and water acted with energy, an abundant and perfectly white deposit was formed on the surface of the water, accompanied with decomposition of the fluid.

Minute quantities of foreign substances affect the liability of iron to rust, some increasing it and others lessening it. Thus impure iron may have a greater or less tendency than the pure metal to oxidation, and this fact is exceedingly important, for it points the way to investigations which may lead to a new classification of irons. Cold short and red short, hard and soft, are qualities which affect the commercial uses of iron, and if to these can be added rusting and non-rusting iron, there will be immediate use for the latter among bridge and foundation builders, and many other consumers.

Solutions of alkalies, either caustic, carbonate or bi-carbonate, prevent the rusting of iron; and Prof. CALVERT suggests that caustic alkalies can be thrown into the holds of iron ships that suffer from the action of bilge water on the plates. Sugar greatly increases the tendency to oxidation, a fact that explains the rapid destruction of iron ships engaged in carrying sugar. Prof. CALVERT renews the recommendation he made some years ago, that a small piece of zinc should be fixed to each plate of iron. This renders the metal "passive" and prevents oxidation. Under ordinary circumstances, the zinc will protect the iron when it covers only 1-100th part of the latter's surface; but, with sugar water the proportion must be 1 zinc to 15 iron surface.

Professor Rankine.

Glasgow papers of February 15 publish the following obituary resolutions passed by the Faculty of the Stevens Institute upon the death of Professor RANKINE, and which had just been presented by Principal BARCLAY, to the Council of the University of Glasgow.

At a special meeting of the Faculty of the Stevens Institute of Technology, held Wednesday, January 15, 1873, the following resolutions were moved by Prof. THURSTON and unanimously adopted:

Resolved, That we have learned with profound regret the death of Professor WILLIAM JOHN MACQUORN RANKINE, of the University of Glasgow, Scotland.

Resolved, That in his death we feel that we have lost a most eminent member of the Engineering Profession, a distinguished brother in science, a rarely-gifted scholar, and one who, in a degree seldom equalled, has aided the great cause of the application, in technical and general education, of scientific knowledge.

Resolved, That we find, in the vast amount of valuable work accomplished by the deceased, cause of thankfulness to Him who doeth all things well, for the preservation until now of so fruitful a life.

Resolved, That copies of these resolutions be forwarded through the United States Consul at Glasgow, to the Council of the University of Glasgow, and to the family of the deceased.

HENRY MORTON, President.

C. F. KROECH, Secretary.

Prize for Steel.

We have received, says *Iron*, from P. LE NEVE FOSTER, Esq., Secretary of the Society of Arts, the following amended programme of condition of the Prize for Steel:—1. The Council have resolved to offer the Gold Medal of the Society to the manufacturer who shall produce and send to the London International Exhibition of 1873 the best collection of specimens of steel, suitable for general engineering purposes. 2. The specimens exhibited must include a complete illustration of the applications of the varieties of steel submitted. 3. Each manufacturer should send with his specimens a statement of the nature of the tests he has applied to each kind of steel submitted, and give the results of such tests. 4. The samples tested are to be exhibited, together with duplicate samples, or portions of the same samples; these will be submitted to tests should the Council consider it desirable. 5. All persons using steel for general engineering purposes, who are not manufacturers of such steel, are also invited to exhibit specimens on the above terms and conditions. 6. The Council reserve to themselves the right of withholding the premium, in the event of the specimens exhibited not being sufficiently meritorious.

The South Wales Strike.

Mr. BROGDEN, one of the South Wales masters, affected a compromise with his men on the following terms. Instead of the ten per cent. reduction demanded by the masters, the men resume work for two weeks at five per cent. reduction. At the end of the fortnight the old rate is to be paid for four weeks, and then five per cent. advance for three months, the latter concession being made in consideration of the late advance in coal. Other masters, among them Mr. CRAWSHAY made a compromise proposition which was, that the workmen should work at the ten per cent. reduction for six weeks, and then receive the old rate. This was refused though Mr. CRAWSHAY had told the workmen's committee that his works should remain closed for years before he would agree to terms such as those conceded by Mr. BROGDEN.

In the table printed in our account of the Monnier process last week, we spoke of 110 pounds of copper as the *loss* per ton when it should have been the yield, an error which the words immediately following almost sufficiently correct. The address of this inventor of this process is Mr. ALFRED MONNIER, care Stevens' House 27 Broadway, New York.

* A paper read before the American Institute of Mining Engineers, Boston, Feb. 19, 1873.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
JOHN A. CHURCH, E. M.
Editors.

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WE learn, with extreme pleasure, that Mr. HERBERT GRAY TORREY has been appointed Assayer at the U. S. Assay Office, in this city, to fill the vacancy caused by the death of his father. Not often does an appointment so completely satisfy, as in this case, the requirements at once of the public interest and of friendly sympathy. We congratulate the Government, as well as Mr. TORREY, upon his deserved promotion to an office, with the duties of which he has long been familiar—formerly as the assistant, and latterly as the acting representative, of his distinguished father. The principles of "civil service reform" are illustrated in his succession to the vacant chair, while, at the same time, it may serve as an additional testimony of the public gratitude and respect towards the beloved and trusted officer whom the country has lost. May his son be his worthy successor!

A BILL has passed Congress, and been signed by the President, which extends the operation of the fifth section of "an act to promote the development of the mining resources of the United States," passed May 10, 1872. This is the section which fixes the expenditures of labor and improvements on claims located prior to the passage of said act, and the time for the first annual expenditure on those claims is extended to June 10, 1874. To the miners in many of the Western districts, this extension of time will be a disappointment, for it defers, by thirteen months, the date at which abandoned claims fall in, and can be located. Our sympathies are by no means with those careless or greedy locators who now have a firm hold upon claims which they have no intention of working, but which others stand ready to make useful to the country, and we confess that we regret the passage of the amendment, as unnecessarily complicating the existing relations between the miners and the government, and postponing the desired and desirable era of simplicity and security in our mining law. The obnoxious tunnel-section of the Act of 1872, which ought to have been amended, has not been touched.

The British Iron Trade.

IT is an old saying that when a man begins to go down hill every one gives him a kick, and we have, in charity, refrained from publishing many apparently well-founded comments upon the anomalous condition of the iron trade in England, for fear of seeming to lean too strongly toward the opinion, which some so lightly express, that the day of English supremacy in iron making has gone by. That such is the fact—within limits of course—we firmly believe. We are not of those who look to see the manufacturing industry of Great Britain sink into inaction. From present appearances it seems more likely that the manufacturer of the future will have his factories in other lands and his home in England, for the extreme wealth of that country drives it possessors to seek investment everywhere but at home, while, as a *home*, they cling to their own country. But, considered simply as an overwhelming producer of iron and as a controller of the world's prices, it does appear that the day of England has passed. We do not see how any one can look upon the progress made in this and other rival countries and fail to see that, whatever pre-eminence England may hereafter have in the production of the world's iron, the absolute command has passed out of her hands. We print in another column an extract from the market report of the *Mining World*, dated February 22, giving a picture of the trade in Great Britain which is interesting for its historical reminiscences as well as for its view of the present state of affairs.

We will remark here that it is just at the present juncture that business sagacity and scientific management are reaping their rich reward in England. Those ironmasters, who have planted themselves upon the most favorable attainable conditions of ore and coal supply, are building new furnaces and preparing for extension of business at the very time that their rivals are throwing up the sponge in disgust, or transferring their energies to other countries. Those regions where scientific study has been the basis of progress in furnace construction and furnace management, are now the very ones to stand firm when the shock comes. KOHN points out, in his *Manufacture of Iron and Steel*, that there are three "schools" of iron-makers in Great Britain. First, those who treat rich ores with dear fuel, as in the Ulverstone and Barrow-in-Furness district. Second, those who have poor ores, but cheap fuel, as in Cleveland. Third, those whose ores are rich and whose fuel is cheap, conditions which obtain in Scotland. In the latter country the progress made in the economical treatment of ore has often been slighted because the masters thought that the gain was not worth the trouble. The consequence is, that to-day districts which labor under serious disadvantages are seen in bold rivalry with other regions which are the favorites of nature. It remains to be seen whether Scotland can regain its relative position by practicing the economy which gives other districts their strength.

As the article we copy shows, the district which suffers most severely in the trying circumstances of the day, is that one where the worst ores are found and the worst iron made—Wales. Consumers of iron have gradually been coming to the conclusion that cheap iron did not pay in use, and a very much smaller proportion of it has entered into the orders for railroad iron. This fact, combined with the sudden increase in the cost of production, an increase which is of course proportionately greater for an impure ore than for one which requires less fuel and less labor for its manufacture, has brought about the temporary abandonment of the great Welsh works, which our contemporary so strikingly describes.

The Prospect of a Strike in New York.

The daily papers report that the employees and workmen in several leading trades of New York city are looking forward to a general strike this Spring. The movement, of course, must begin with the men; but it has been anticipated by the employers, who have been preparing for it for months. Their preparation consisted in getting as much work out of the way during the winter as possible, and leaving little for the spring. They are reported to be determined, and the condition is such that the struggle can have but one result—the defeat of the men. It is possible that the danger of a strike is exaggerated by the reporters, and that the season may pass without any remarkable demonstration, especially in view of the known determination and readiness of the employers. But we are inclined to think that if a strike does come, the expectation that it will result favorably to the employer is reasonable. A sudden and unexpected refusal to work, on the part of the laborers, is a dangerous thing for the master, who finds himself with engagements which he must work out, often under penalty, within a given time, and which he very rarely can interrupt without serious loss. He can well afford to yield to moderate demands, if he can prevent the strike by that means. But, as Mr. CRAWSHAY told the Welsh strikers, all this is changed the moment the strike has taken place, the machinery has stopped, and furnaces have cooled down. The master receives, in the first few days, all the harm his men can do him. After that a week or a year makes but little difference to him, while the disaster grows every day to the workman, whose means steadily diminish until downright suffering and want are reached.

If the strike takes place, it will be under very peculiar circumstances. There are no signs of suffering among the poor. On the contrary, in spite of a winter of unusual and unexpected severity, the calls upon the charitable have not been excessive, and the newspapers have been entirely free from those stories of suffering which mark the prevalence of short work and low wages in a hard season. Judging from the outside aspect of things, the New York workman can obtain food enough to keep him, and clothing enough to warm him, even in this unusual winter. There is, then, no absolute necessity for increase of pay.

In fact, the American workman rarely has the reasonable ground for a strike which is the real basis of disaffection in other countries. His wages are never degradingly low, and he can fulfill all the functions of a citizen and a respected man upon his earnings. In other countries we see each member of the family—husband, wife and children—earning bread, and forced to do so because the basis of wages is such that the head of the family cannot always, by his unaided ex-

ortions, support the family. But in America, in nearly all trades, quite another state of things exists. The wages of the laboring man enable him to maintain his family so that his wife does not have to work for wages, and his children can go to school up to a very advanced age.

We submit that the richest man does no more than this. He wears finer cloth and eats game when the workmen is dining off beef and pork. But these are merely accidental differences which do not disturb the real equality of condition mentioned above. Sufficient food and clothing, privacy in home life and the education of his children are a sufficient reward for a day's labor, in any condition of life. Indeed this is neither more nor less than the Utopian equality of the philosophers. And yet these conditions are, with remarkable uniformity, the wages of labor in the United States. The capable attain them, and the shiftless come nearer them here than in any other country in the world.

We have pointed out this difference between the *status* of labor here and abroad, because of its pertinency to the widespread agitation in England and to the comparative quiet in this country. We believe that the cause lies as we said before, in the fact that the American master long ago granted—or was compelled to grant, if that form of expression is preferred—all or nearly all that an average man can demand for his labor. We know very well that such considerations will not have a particle of weight with men who think they can gain an increase of pay by striking. But that they do weigh with the masters is seen in the determination with which this threatened strike in New York is met.

The Sands of Little Cottonwood.

IN the discussion over Mr. ENGELMANN's paper on the mines of Little Cottonwood, Utah, which took place at the Boston meeting of the Institute of Mining Engineers, Professors SILLIMAN and BLAKE suggested that a good deal of the supposed siliceous sand on the dumps of the Emma and other mines was dolomite; and a sample of this dolomitic sand was subsequently sent to Mr. ENGELMANN, for comparison with his own samples. A communication from him now lies before us, the substance of which we shall proceed to give, as a satisfactory solution of the question at issue.

Mr. ENGELMANN frankly admits that he has overstated the amount of the siliceous sand, having hastily included in his estimate much that was to a large extent dolomitic. Frequently this dolomitic sand is so refractory as not to effervesce readily in acid, *unless heated*. Mr. ENGELMANN was in some instances misled by this fact, having made many tests merely in rough miner's fashion, in the bottom of a tumbler, with cold acid, under which circumstances a larger part of the carbonates remained undissolved. He now agrees with Professor SILLIMAN, that the main body of the fine sand in the low-grade Emma ore contains carbonates in predominance; though portions of these ores are highly siliceous, and the average contains more silica than the samples upon which Professor SILLIMAN's opinion was based.

The Lexington mine, on the south side of the canyon, carries a quartzose vein-matter; and the ore of the Louisa mine, also in the southern mountains, and in the lower limestone belt, contains a large percentage of insoluble matter—siliceous sand. This is true of other mines in the district also; but the sands of the series from the Emma to the Reed and Benson are characteristically dolomitic.

Mr. ENGELMANN does not alter—and, so far as we can see, need not alter—his views concerning the secretion of silicates and silica from the saccharoidal rocks. The quantity of the silica is less than at first supposed; that is all. His view of the origin of the veins and deposits may not be proved; but it certainly is not disproved. He suggests, however, though the suggestion may contradict his theory, that the siliceous rock in the Lexington may have originated from the higher quartzite, an altered sandstone, now removed by denudation at that point, but which must have existed only a short distance above. Mr. ENGELMANN evidently cares more for getting at the facts than for defending any theories—even his own; and his candor in this case, while it prematurely cuts short a lively debate, will undoubtedly do more than debate could do, to forward our scientific knowledge of the interesting points in question.

NEW PUBLICATIONS.

TRANSACTIONS OF THE WISCONSIN ACADEMY OF SCIENCES, ARTS AND LETTERS. 1870—2. *Published by Order of the Legislature.* Madison, Wisconsin, 1872.

The Wisconsin Academy was organized in February, 1870, and the present volume comprises its transactions for two years. We find in it lists of the officers and members, the general report of the President, Dr. J. W. HOYT, of Madison; some of the papers read before the Academy, and the proceedings of its meetings. The President's report contains an interesting review of what has been done "by, and in behalf of," the State of Wisconsin in science, the arts, and letters. The record, up to the foundation of the Academy, is not a brilliant one. As Dr. HOYT says, "It shows that in the practical arts—in the rough work of civilization—we have achieved marvelous results for a State of but twenty-two years, it reveals, on the other hand, how little has been accomplished in those higher fields of human activity—the scientific, literary and æsthetic."

The Academy appears to have developed a promising amount of home talent and activity. Several of the papers contained in this volume are valuable contributions to social or physical science. In the former department we may mention Mr. CAVERNO's paper on *Woman Suffrage*, and Mr. HASTINGS' paper on *The Common Jail System.* In the department of the natural sciences we find the following contributions, the names of which we give in full, as they may be valuable to some of our readers engaged in similar investigations: *Deep Water Fauna of Lake Michigan*, by P. R. HOY, M. D.; *The Classification of Plants*, by J. A. LAPHAM, LL. D.; *Aphides*, by P. R. HOY, M. D.; *Coniferæ of the Rocky Mountains, and their Adaptation to the Soil and Climate of Wisconsin*, by J. G. KNAPP; *Geology of the Region about Devil's Lake*, by Prof. JAS. H. EATON, Ph. D.; *Age of the Quartzites, Schists and Conglomerates of Sauk County*, by Prof. ROLAND IRVING, E. M.; *Suggestions as to a Basis for the Gradation of the Vertebrata*, by Prof. T. C. CHAMBERLIN; *Ancient Lakes of Wisconsin*, by J. G. KNAPP; *The Mineral Well at Waterloo, Wisconsin*, by Rev. A. O. WRIGHT; *Potentials, and their Application in Physical Science*, by Prof. JOHN E. DAVIES, M. D. In the department of the arts, Mr. W. H. SHERMAN contributes a paper on *The Production of Sulphide of Mercury by a New Process, and its Use in Photography.*

The interesting nature of some of the geological papers leads us to hope that the "progressive and thorough scientic survey of the State," which is one of the special objects of the Academy, as set forth in its charter, may not be long delayed. The history of former attempts is summed up by President HOYT, who succinctly narrates that the State four times in quick succession legally recognized the importance of a geological survey: once in 1853, by the appointment of EDWARD DANIELS as State Geologist; once in 1854, by the appointment of JAMES G. PERCIVAL, to succeed Mr. DANIELS; again in 1857, by the reappointment of Mr. DANIELS, after the death of Dr. PERCIVAL; and yet again in 1858, by the appointment of a Geological Commission, consisting of Prof. JAMES HALL, of New York, and EDWARD DANIELS and E. S. CARR, of Wisconsin. Nevertheless, except in the lead region, to which special attention was given by the several State geologists, little more than preliminary work had been accomplished up to 1861, when the law instituting the survey was repealed.

A TREATISE ON THE STRENGTH OF BRIDGES AND ROOFS, *with Practical Applications and Examples, for the Use of Engineers and Students.* By SAMUEL H. SHREVE, A. M., Civ. Eng. New York: D. Van Nostrand. 1873.

A simple and clear treatise on this subject, so arranged as to be available to engineers in the daily exigencies of practice, is a very desirable thing; and those who have read Mr. SHREVE's articles on the subject, in Van Nostrand's *Eclectic*, will be glad that he has taken the step of publishing this book. The plan of the work is logical and satisfactory. The part we like least is the introductory chapter. Mr. SHREVE is not happy in his statement of elementary principles. A student, unacquainted with the mechanical theorems involved, will find it difficult to follow him; and, on the other hand, the student already familiar with the subject will not be satisfied with this incomplete and obscure exhibition of them. The law of the lever, as given on page 2, is rendered inaccurate by the careless use of the word *farther*, instead of *other*. But, this introduction being passed, the author goes at the real work before him in a straightforward and thorough way. Beginning with the simple truss, supported at the ends and loaded at the center only, he discusses successively the modifications of this case presented by the different positions and uniform or irregular distribution of the constant load, and then by variable and moving loads. The simple truss with inclined struts and vertical ties, and trusses with vertical struts and inclined ties, subject to constant and to moving loads, are analysed and discussed at length, in natural succession, from the simple truss to the double truss with even number of panels, the same with odd number of panels, and so on through the triple and quadruple forms. Another chapter introduces the element of horizontal chords with struts and ties of equal inclinations. This is followed by a chapter on trusses with horizontal chords and inclined braces, the ties having a different inclination from the struts; then come inclined trusses or rafters, triangular trusses, bowstring trusses, lenticular trusses, and several varieties known by the name of their inventors, as Kinlenberg, Bollmann, and Fink. The book concludes with a treatise on the resistance of different materials to compression and tension—these being the only strains to which structures of this kind are subjected—at least when they are properly made. The diagrams in the book are small, but intelligible, and suitable for the demonstrations.

It is a noteworthy point that all the calculations are made algebraically, without the use of the higher mathematics. This renders them more useful to those of us who are so long out of school as to be rusty in our reminiscences of the calculus. Mr. SHREVE does not express opinions concerning the merits of this or that construction; he merely gives the means by which every structure may be tried and its merits unerringly determined.

ZELL'S DESCRIPTIVE HAND ATLAS OF THE WORLD. T. ELWOOD ZELL. Philadelphia and New York. Parts 14 to 22 inclusive. Price 50 cents per number.

These numbers include maps of Africa, North America, New England, Canada, the United States, New York, New Jersey, Pennsylvania, Australia, New Zealand, Ohio, Indiana, Illinois, and the Southern States. The execution is very neat, and the maps are excellent guides to the countries which they cover. County lines, rivers and railroads are plainly shown, and the Atlas proves in every number the value and necessity of such a work.

IRON, The Journal of Science, Metals, and Manufacturers, with which is incorporated the *Mechanic's Magazine.* London, published every Saturday.

The proprietors of the *Mechanic's Magazine* which has always been one of the most wide awake and useful journals of science published in England, have changed the scope of their paper and given it a new name. It is now called *Iron* and deals with that metal as a chief subject of discussion. The paper has

at the same time been very much enlarged, so that the old departments of the *Magazine* are kept up undiminished by the larger space devoted to the specialty of the paper. Only four numbers of the new series have been issued, but those are excellent, and the paper promises to be one of the best in the literature of the most important metal known to man. W. J. RUSBY, 99 Cannon street, London, is the business manager, and the price of the journal to Americans is thirty shillings English.

The Temperature of Compressed Air.

(Continued from page 180.)

The weight of one cubic foot of air, as taken at mean atmospheric pressure and temperature is 0.076,391 pounds avoirdupois. At the freezing point it is 0.080,728, if at atmospheric pressure, its weight varying, under constant pressure, inversely as the absolute temperature.

Pressures in lbs. per square inch above a Vacuum.	Temperatures measured from the zero of		Volumes under Temperatures		Pressures in column A less 15 lbs. per sq. in.
	Absolute scale.	Fahrenheit.	Variable.	Constant.	
0	0°0	−461.°2	Infinite.	Infinite.	−15
5	381.°2	− 80.°0	215.0	294.0	−10
10	466.°1	+ 4.°9	131.5	147.0	− 5
15	524.°3	63.°1	98.6	98.0	0
20	569.°9	108.°7	80.4	73.5	+ 5
25	608.°0	146.°8	68.6	58.8	10
30	641.°0	179.°8	60.3	49.0	15
35	670.°3	209.°1	54.0	42.0	20
40	696.°8	235.°6	49.1	36.8	25
45	721.°1	259.°8	45.2	32.7	30
50	743.°3	282.°1	41.9	29.4	35
55	764.°2	303.°0	39.2	26.7	40
60	783.°4	322.°2	36 8	24.5	45
65	802.°1	340.°9	34.8	22.6	50
70	819.°5	358.°3	33.0	21.0	55
75	836.°1	374.°9	31.4	19.6	60
80	851.°9	390.°7	30.0	18·4	65
85	867.°0	405.°8	28.8	17.3	70
90	881.°5	420.°3	27.6	16.3	75
95	895.°4	434.°2	26·6	15.3	80
100	908.°8	447.°6	25.6	14.7	85
105	921.°8	460.°6	24.8	14.0	90
110	934.°3	473.°1	24.0	13.4	95
115	946.°4	485.°2	23.2	12.8	100
A	B	C	D	E	F

Absolute Pressure lbs. on sq. inches.	Temperatures above		Volumes with Temperatures.		Pressures column A, less 15 lbs.
	Absolute zero.	Fahrenheit zero.	Variable.	Constant	
120	958°.2	497°.0	22.52	12.25	105
125	669.°6	508°.4	21.88	11.76	110
130	980.°7	519°.5	21.28	11.31	115
135	991.°5	530°.3	20.71	10.89	120
140	1002°.0	540°.8	20.20	10.50	125
145	1012°.2	551°.0	19.69	10.14	130
150	1022°.2	561°.0	19.22	9.80	135
155	1032°.0	570°.8	18.78	9.48	140
160	1041°.5	580°.3	18.36	9.19	145
165	1050°.9	589°.7	17.96	9.00	150
170	1060°.0	598°.8	17.59	8.65	155
175	1069°.0	607°.8	17.23	8.40	160
180	1077°.7	616°.5	16.89	8.17	165
185	1086°.3	625°.1	16.56	7.95	170
190	1094°.8	633°.6	16.25	7.74	175
195	1103°.1	641°.9	15.95	7.54	180
200	1111°.2	650°.0	15.67	7.35	185
205	1119°.2	658°.0	15.40	7.17	190
210	1127°.0	665°.8	15.15	7.00	195
215	1134°.7	673°.5	14.89	6.84	200
A	B	C	D	E	F

MINING SUMMARY.

California.

GRASS VALLY DISTRICT.

From the Grass Valley *Union* of March 4.

The month of February was one of storms, and consequently mining in the upper part of the country was greatly interrupted. The heavy snow falls filled the ditches and prevented the flow of water, and without running water a gravel miner cannot ply his vocation with success. There is no disaster, however, in those heavy snows, but a great advantage. They give more available water in the end than if heavy rains had fallen instead of heavy snows. The heavy storms have also lessened the production of gold in this quartz district, because where mill and mine are not immediately connected, hauling from mine to mill, in wagons, was so slow and tedious that but little work in that way was done. The weather did not, however, prevent the work of underground men or taking out of ore. The mills will only have to work the more in order to catch up with the well filled dump piles. But in the upper parts of the country the sunshine of the last few days has caused the water to run and the gravel miners are busy at work—so busy indeed that none of them have time to send an item to the papers. Generally the Spring and Summer season will be very profitable to the miners of all classes in Nevada county.

THE IDAHO

mine's monthly run closed on Saturday, the 22nd of February. The mill (35 stamps) worked twenty-two days and gave gold to about the value of $75,000. For the six days ending last Saturday, the Idaho cleaned up about $20,000, which is to be aggregated with the proceeds of the current month. The January run of the Idaho gave about $72,000. The usual dividend of $16,500 (possibly more) will be paid this week. Appearances underground are, of course, as good as can be expected.

EUREKA MINE

has with ten stamps given about $47,000 for a month's run. We regret to state that no changes for the better have taken place in the lower depths of the Eureka. Work of exploration is going on, and the company does not seem ready to give up its determination to find lower pay or cinders.

SLATE LEDGE,

or Perrin's, has done but little crushing during the month, because the roads were so soft that it did not pay to haul the ore from the mine to the mill. Hauling commenced yesterday and the mill was immediately started up. There are about one hundred tons of good ore on the dump at the mine. The ledge is large and shows rich in mineral.

COE

mine has just finished repairing and retimbering the main shaft. A contract to sink the main shaft fifty feet lower, with the privilege to the contractors to sink 100 feet, was let yesterday to a company of eleven workingmen, and the contractors have gone to work.

DAISY HILL

continues to send out good milling ore, and has a good sized dump ready for crushing. Bad roads have prevented hauling from the dump to the mill. The last crushing gave $42 to the load, and the rock now on the dump will, it is estimated, come up to those figures in yield.

GREENHORN

mill and mine are working away night and day. The ledge is large, with beautiful walls, giving every assurance of permanency. The crushing now going on will give something like $25 to the ton of ore.

GREEN MOUNTAIN

mine during its last business month, made a run of 18 days with its five stamp mill, cleaning up gold to the amount of $2,545, which leaves a good profit. The value of the sulphurets saved is not counted. The sulphurets are rich and heavy. The appearance of the ledge is very encouraging.

HOWARD HILL

mine shows a most gratifying improvement. The shaft is down 390 feet, and from the bottom drifts have been run east and west. Both drifts are in good paying ore, with a ledge from two to two and a half feet thick. The quartz of the ledge will pay, according to the judgment of experienced men, at least $20 a ton. The walls of the ledge are what the miners call "beautiful." The present working of the Howard Hill are one hundred feet lower down than any former workings of the mine.

GRASS VALLEY NEW MINING COMPANY.

Capital stock, $300,000—3,000 shares at $100 each. Trustees: P. H. PAYNTER, Pres.; GEO. FLETCHER, Sect.; WM. PRISK, SAMUEL TERRILL, and FRANCIS CARTER. The object of this Company is mining, prospecting, buying and selling mines of gold and other precious metals. At present they are prospecting on a ledge formerly known as the Imperial, about one mile from Grass Valley on the Nevada road, on which they are now sinking a fine timbered shaft, 9x11½ feet in the clear and have a good ledge from twenty inches to over two feet thick which prospects well. They are also negotiating for other mining property at the present time.

PROSPECT MINING COMPANY.

Capital stock $600,000—6,000 shares at 100 each. Trustees: Geo. FLETCHER Pres.; P. H. PAYNTER, Sect.: A. POWNING, C. NETTLE and Wm. POWNING. Object: Same as the Grass Valley New Mining Company. They are at present prospecting on the West Idaho ledge on Slate Creek, on which they own 3,000 feet. This ledge was worked some two years ago by a company which sunk several shafts, probing the ledge for some 2,000 feet to water level, with flattering results, but inability to raise money to buy machinery, and disagreement in the Company caused it to be ultimately abandoned. The present Company's claims extending nearly to Deer Creek, gives them a splendid opportunity to work the ground through a tunnel and at but little expense, the hill being at an angle of over 20 deg., thus giving them fully 235 feet of backs, from where they are now drifting by the time they reach the center of the hill with a tunnel of 500 feet with the opportunity of going 150 lower should they wish it at some future time. This ledge has a fine appearance showing fine sulphurets, galena and free gold, and being in range of the Eureka and Idaho belt, is well worthy of a thorough prospecting.

KENTUCKY MINING COMPANY

was organized last Thursday evening, with a view to incorporation. At a meeting at the Pacific Hotel, at which the whole amount of stock was represented, it was agreed to incorporate with a capital of $650,000, divided into 6,500 shares of $100 each. The trustees are A. B. BRADY, President GEORGE FLETCHER, Secretary, WILLIAM THOMAS, GEORGE LORD and A. MOREHOUSE. The object of this company is to work the Kentucky ledge owned by the company and situated north of the Eureka ledge. This ledge has had considerable money taken out of it in former years, the last 149 loads of rock averaging $17 per load, and some paying as high as $30; but the company not being properly organized was unable to put on the required machinery, which will now be done. There has been considerable excitement on this claim lately in consequence of striking good ore 400 feet from the main shaft while doing a few days work to hold the ground. The prospect of immediate pay as soon as machinery is in place is very flattering, as the ledge is large and easily worked.

INDEPENDENCE CONSOLIDATED

Mining Company is still running a tunnel through Independence Hill, near Dead,

man's Flat. The tunnel is now in the distance of 375 feet, and the rock is very hard. During the last month a foot a day was averaged in running the tunnel. The ledge has not yet been cut, though stringers that bear gold are in the tunnel. The stringers prospect well.

NORTH STAR

continues to have splendid ore in the new shaft. The mill will begin, at an early day, to turn out gold in paying quantities. The prospects of the North Star are very encouraging.

GRAVEL MINES.

The Hope is on the assessment roll just at this time. Work is being done all the time in the lower depths of Alta Hill for a Hope lead.

The Dartmouth is sinking a shaft on the north end of Grass Valley slide which is the east end of Alta Hill. The gravel from the shaft is being put through a five-stamp battery and the yield is paying expenses. The Dartmouth will soon be down into drifting gravel which will pay well.

The Town Talk is doing a little better than it has done heretofore. That mine has paid a clear profit, for two years past, of $1,200 a month clear to two owners. Its gravel now shows that it will pay much better in the months to come.

The Independent gravel company has a good lead, which adjoins the Town Talk. The gravel and cement are put through the crushing process which saves almost all the gold. This gravel lead appears to run through the Howard Hill claims. In other words the Howard Hill has good quartz and splendid gravel.

The Picayune Gravel Company, near Rough and Ready, continues to pay largely over the cost of development. This Company will open a channel that will stimulate the gravel mining interest on Randolph Hill.

Montana.

[THE QUARTZ LODES IN AND AROUND BANNACK.

From the Deer Lodge City *Independent* of Feb. 15 :

Bassette & Ney have bonded the Brick Pomeroy lode for $37,000. This lode is well defined, of good width and contains a solid mass of rich ore. There is about 150 tons on the dump and more is daily added. It is claimed that a ten stamp mill could be kept constantly running from this lode alone.

The Delmonico is being worked by Smith & Sears. It shows a good body of fine ore. Sam Batchelder has some 80 tons of high grade ore on the Huron dump. The Huron is considered one of the best lodes in the district.

The Blue Wing lode is being vigorously worked by Harvey & Co. It looks well and the ore is of superior quality. The New Departure is yielding an abundance of first class ore. A large force of men are employed in mining, assorting and sacking the ore. In the spring it will be shipped to San Francisco for reduction. It will average about $500 per ton. It is owned by Wash Stapleton, than whom there is no more enterprising or deserving miner in the Territory.

Joe Larwell is now engaged in developing the Whopper lode and has opened up a splendid body of rich ore. Phil Shenan is runningthe Butterfield Mill very successfully on ore from the Dakota lode.

The National Mining & Exploring Co., who are now successfully operating at Unionville; are opening No. 5 on the Dakota and have developed a magnificent body of first class ore. The St. Paul lode is yielding a large quantity of excellent ore under the skillfull management of Messrs. Brown & Merry. The shaft on the Black Hawk lode is now down 300 feet and shows fine ore the entire distance, but is of moderate grade.

The bulk of the quartz in the vicinity of Bannack is the kind which is generally termed "base" and cannot be successfully milled by the ordinary processes. However, many of the mines produce ores that pay largely for shipment to the East and San Francisco, notwithstanding the great cost. Many hundred tons will be shipped during the coming spring and summer. Mr. Konsingberger, of Helena, is now in Bannack, purchasing ore for shipment and other buyers are expected there shortly.

The miners in that region have wisely determined to wait no longer for capitalists to purchase their mines, but have gone to work developing and preparing the quartz for shipment. This is indeed commendable and their example might be followed advantageously by the miners in all those camps whose ores will pay for shipment.

LONDON METAL MARKET.

LONDON, March 8, 1873.

At last we begin to see light breaking through the cloud that has so long rested on the iron and coal trades. Although the strike is not ended yet, there are signs that the end is near. The general impression on the market here is that it has now reached the last, or almost the last stage, and that in a short time the men will be at work again. The feeling has, in a measure, interfered with the trade in iron. Buyers, who are looking to a speedy reduction in the price of fuel, and consequently in iron, are holding back as much as possible. Railway orders are, however, coming in briskly, and there is a great deal of animation in the export trade. The diminution in the consumption of fuel in the manufacturing districts, together with the increasing mildness of the weather, has brought down the price of coal, and it is likely to have a still further fall. There has been an increase in the trade in iron ores from Ireland and foreign ports, and for a time, at least, this activity is likely to continue. As will be seen on reference to our price list and account of sales, there has been, on the whole, a fairly active market and good prices.

IRON.—The market still shows an upward tendency, prices being considerably higher than last week. The result is that comparatively little new business is done, but manufacturers have their hands full, the old contracts being still far from completed, the scarcity of fuel interfering greatly with prompt delivery of orders. The trade in all kinds of railway material shows increased activity, and Continental American Colonial orders have been on the increase. Best Welsh bars in London have been from £13 5s. to £13 10s., Glasgow pig from 142s.3d. to 144s. 9d.

COPPER.—There has been a very good amount of business done, with considerable fluctuation in prices, caused partly by speculative realisations, which have disturbed the tone of the market and unsettled the operations of regular traders. On Thursday 500 tons Chile bars were sold at from £85 cash to £86 and £86 10s. three months prompt; and 50 tons Wallaroo, £92 cash. On Friday, the market continuing firm, 300 tons Chili bars changed hands at from £85 to £85 10s. cash, and £86 15s three months; there were buyers of Wallaroo at £92 cash. Saturday copper remained steady, and there were a few sales of Lota at same price as Friday. There was a good demand on Monday, more than 500 tons Chili bars, good ordinary brands, sold at from £85 to £86 cash. Tuesday there were some large sales at varying prices; 600 tons good ordinary brand were sold at from £84 15s. to £85 10s. sharp cash, closing with buyers at the higher price; 125 tons Wallaroo sold at £91 7s. 6d. to £92 cash, 50 tons Chili £87 ten weeks, and 600 tons ore Regulus at 17s. per unit. Wednesday 250 tons Chili at from £85 cash for Lota, and £85 10s. to £86 for good ordinary brands, also cash. The market closed very firm.

TIN.—There has been considerable activity and large sales this week, with an advance on last week's prices. The sales reported on 'Change were, Thursday, 90 ton Straits, £142 to £143 10s. Friday, 100 tons Straits, £143 10s. to £144. Saturday, 50 tons Straits, £144, and a demand for English Ingots at £146. Monday, 90 tons Straits at Saturday's price. Tuesday, 45 tons Straits at £145 cash, and 70 tons to arrive from £143 to £144. Wednesday, 140 tons Straits at £145 cash to various buyers; English ingots, £146; bars, £147; refined, £149.

LEAD.—A firm market throughout the week, with former prices fully maintained. Soft English pig opened £22 10s., but on Wednesday £23 was readily obtained. Spanish silver realized £21 15s. to £22 5s.

SPELTER.—A good demand and large sales with prices higher. The market closing with buyers for English at £27, as against £25 10s. to £26 last week. 25 tons Silesian were sold on Wednesday at £27.

QUICKSILVER has been scarce and in good demand. The export has been large, 770 bottles in one vessel alone to the West Indies. Prices have ruled from £13 10s. to £14 per bottle.

ZINC was also in good demand at last week's prices, £13 10s. having been obtained on Wednesday for 100 tons foreign.

ANTIMONY.—100 tons star sold at from £60 to £62.

Tin Plates continue firm with a fair demand.

IRON.

METALS.

NEW YORK, March 20, 1873.

IRON.—Duty: Bars, 1 to 1½ cents ℔ lb; Railroad, 10 cents ℔100 lbs.: Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig,$7 ℔ ton; Polished Sheet, 3 cts. ℔ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ℔ ton	— —@65 00
Gartsherrie	— —@60 00
Glengarnock	56 00@57 —
Eglinton	55 00@— —
Pig, American, No. 1	50 00@51 00
Pig, American, No. 2	47 —@48 00
Pig, American, Forge	42 00@44 00
Bar Refined, English and American	— —@110 00
Bar Swedes, assorted sizes (gold	120 00@130 00
	Store Prices, Cash.
Bar, Swedes, 1¼ to 5 x ⅜ & ⅝ 2 sq. & 6 to 12 x ¾ & ½	150 00@160 00
Bar, Refined, ¾ to 2 in. rd. & sq. 1 to 6 in. x ⅛ to 1 in.	107 50@— —
Bar, Refined, 1¼ to 6 by ¼	— —@112 50
Bar, Refined, 2½ to 2¾ round 1 & 1⅛ by ¼ & 5:16	115 00@— —
Large Rounds	115 50@127 50
Scroll	150 00@160 00
Ovals and half-round	152 50@152 50
Band	— —@125 00
Horse Shoe	— —@127 50
Rods, ⅝ to 3-16 inch	112 50@155 00
Hoop	155 00@180 00
Nailrod	@ 9¾
Sheet, Russia, as to assortment (gold)	16 @ 16½
Sheet, Singles, D. and T. Common	—6½@— 7½
Sheet, D. and T. Charcoal	—7¼@— 8½
Sheet, Galv'd, list 5 per cent, discount	—@— —
Rails, English (gold), ℔ ton	70 00@ 71 00
Rails, American, at Works in Pennsylvania, currency	82 50@ 85 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 43
Copper Bolts	— @— 45
Copper Braziers, 16oz. and over	— @— 45
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	28 @— 30
Copper, Old, for chemical purposes, 14@16 oz.	— @— —
Copper, American Ingot	34½@— —
Copper English Pig	30 @—
Yellow Metal, New Sheathing & Bronze	27 @— 00
Yellow Metal Bolts	— @— 32
Yellow Metal Nails	27 @— 30

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1¼ cents ℔ lb. Pipe and Sheet, 2½ cents ℔ lb.

Galena, ℔ 100 lbs	$— — @— —
Spanish (gold)	6 62½@6 75
German, do.	6 62½@6 75
English do.	6 62½@7 00
Bar (net)	9 25 @— —
Pipe (net)	— — @10 50
Sheet	— — @10 50

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb, and 10 ℔ cent ad val. Store prices.

English Cast (2d and 1st quality) ℔ lb	— 18 @— 22
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 11½@— 16
English Machinery	— 11½@— 14
English German (2d an 1lst quality)	— 11½@— 12
American Blister "Black Diamond"	— — @— 11½
American, Cast, Tool do.	— — @— 17
American, Spring, do.	— — @— 11
American Machinery do.	— — @— 11½
American German, do	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.: Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25. ad val.

	Gold ℔ lb.
Banca	38 @38½
Straits	33 @33½
English	33 @—

PLATES.

Fair to Good Brands.	Gold.	Currency
I. C. Charcoal, ℔ box	$12 00 @12 25	$14 12½@14 37½
I. C. Coke	10 50 @10 75	12 50 @12 75
Coke Terne	8 75 @ 9 75	10 50 @11 50
Charcoal Terne	10 75 @11 00	12 75 @13 25

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100lbs.

Plates, Foreign (gold) p. 100 lb.	7 87½@8 00
Plates, Domestic p lb.	8½@— 10½

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c. per Sheet ... per lb.—10½@11 lb

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, March 19th, 1873.

The following report from the San Francisco Stock Board is dated March 18. Raymond & Ely, Savage, and Crown Point are still lower, the remaining portion of the list has slightly declined.

	March 18.	
Savage	— 41	—
Crown Point	— 87	—
Yellow Jacket	— 59	—
Kentuck, "New Issue"	— 9	—
Chollar Potosi	— 42	—
Gould & Curry "New Issue"	— 11	—
Belcher "New Issue"	— 60	—
Imperial	—	—
Raymond & Ely	— 6¼	—
Meadow Valley	— 11	—

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. All members and Associates who pay their dues ($10,) for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

Those members and associates who have not paid their dues for the current year, are requested to do so at once. Money may be sent in postal orders, checks or bank bills, to the Secretary, THOMAS M. DROWN, 1123 Girard street, Philadelphia, Pa.

II. It is expected that the more important papers, read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

III. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

IV. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

THOMAS M. DROWN, Secretary.
1123 Girard street, Philadelphia, Pa.

Advertisements.

Rates of Advertising.

The rates of advertising, compared with those of other weekly, industrial publications, are very low, especially when the class of consumers among which its large circulation is almost entirely confined, is taken into consideration.

Back Page.....40 cents a line.
Inside Pages.....25 cents a line.

Engravings may head advertisements at the same rate per line, by measurement as the letter-press.

MISCELLANEOUS.

WM. A. SWEET, Pres't. GEO. W. HARWOOD, Treas. FRED. B. CHAPMAN, Sec'y.

SWEET'S MANUFACTURING CO.,

SYRACUSE, N. Y.,

MANIPULATORS OF

Bessemer Steel,
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Sweet's Cast Steel Crow Bars,
Sweet's Cast Steel R. R. Bars,
Sweet's Oil-tempered Seat Springs,
Sweet's Excelsior Steel Tire,
Swede's Spring Steel,
Cast Spring Steel,
English Spring Steel,
Sleigh Shoe Steel,
Cutter Shoe Steel,
Frog Point Steel.

Nov. 19:1y

SUPERIOR RAIL MILL.—CAPACITY: 1,000 TONS PER WEEK.

Harbaugh, Mathias and Owens,

Manufacturers of

RAILROAD IRON,

Office, corner Fifth Avenue and Smithfield Street, Pittsburgh.

Our central location enables us to draw from both sides of the Allegheny Mountains Metals and Ores best adapted for making a No. 1 Rail, and together with our Improved Machinery, are a sufficient guarantee of our ability to produce Rails of a quality unsurpassed for durability and strength, by any foreign or domestic manufacture.

New Patterns, of any desirable weight, made to order on Short Notice.

We respectfully solicit orders for New Rails, or Re-rolling. June 26.1y

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KINGDOMS OF PRUSSIA AND SAXONY.

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Whose representative for the United States,

H. ROBERTSON, 149 BROADWAY, NEW YORK,

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ORE and all kinds of FURNACE STUFF

For the above-named Works.

Full particulars given on application. Oct. 8-tf

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E. A. QUINTARD, Agent.

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Alaska Red Ash,
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North Franklin,
Lorberry, and
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DELIVERED IN NEW YORK,

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ALL PORTS ALONG THE SOUND AND HUDSON RIVER.

Circulars of Prices will be issued on the 20th of each month.

MISCELLANEOUS.

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Bessemer Steel Rails, Axles, Tyres, Shafting Plates and Steel Forgings, OF ALL DESCRIPTIONS.

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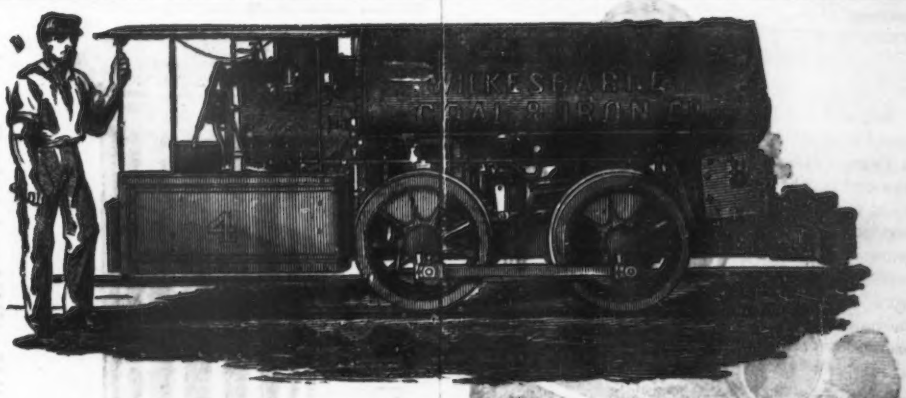
GORDON MONGES, Treasurer. B. C. WEBSTER, President.

WORKS, BETHLEHEM, PA. OFFICE, 333 Walnut Street, Philadelphia.

JOHN JEWETT & SONS, AGENTS, 182 FRONT STREET, NEW YORK.

OXIDE OF ZINC, SPELTER, SHEET ZINC.

Jun28:1y SPIEGELEISEN CINDER FOR BLAST FURNACES.



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Gauge, two feet six inches or upwards; Hight above rail, five feet four inches; Width over all, five feet one inch. Adapted to burn Anthracite or Bituminous coal or coke.

Materials and Workmanship Equal to those in Full Gauge Railroad Locomotives,

Guaranteed to pass curves of twenty-five feet radius and haul on a level track in good condition,

Three Hundred and Forty Gross Tons of Cars and Load

For Photograph and full particulars, address

Feb:7-1y:ecw M. BAIRD & CO., Baldwin Locomotive Works, Philadelphia.

112th Auction Sale.

100,000

TONS SCRANTON COAL.

On WEDNESDAY, MARCH 26th, 1873.

NEW YORK, March 19th, 1873.

The Delaware, Lackawanna and Western Railroad Company will sell, by MESSRS. JOHN H. DRAPER & CO., Auctioneers, at the Company's Sales Room, 26 EXCHANGE PLACE, corner of William Street, NEW YORK, on WEDNESDAY, MARCH 26th, at 12 o'clock, noon,

100,000 TONS

OF

COAL, FROM THE LACKAWANNA REGIONS,

of the usual sizes, deliverable at their Depot, Elizabethport, N. J., during the month of April, 1873.

The sale will be positive; each lot put up will be sold to the highest bidder; no bids, in any form whatever, being made for account of, or on behalf of the Company. The conditions will be fully made known at the time of sale.

TERMS: FIFTY CENTS PER TON, payable in current funds, on the day of sale, and the balance, within ten days thereafter, if required, at the office of the Company.

SAMUEL SLOAN, President.

A METALLURGIST OF CHARACTER AND ability is now open to engagement. Thoroughly familiar with the complete metallurgy of lead, silver, gold, antimony, etc., and competent to erect and manage reduction and technical works of any magnitude. First-rate Assayer and Analytical Chemist. References if desired. Address METALLURGIST, San Francisco, Cal.

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WATER, STEAM OR COMPRESSED AIR.

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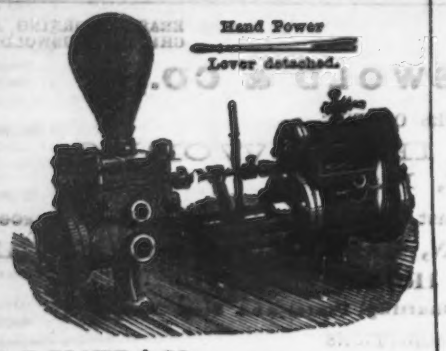

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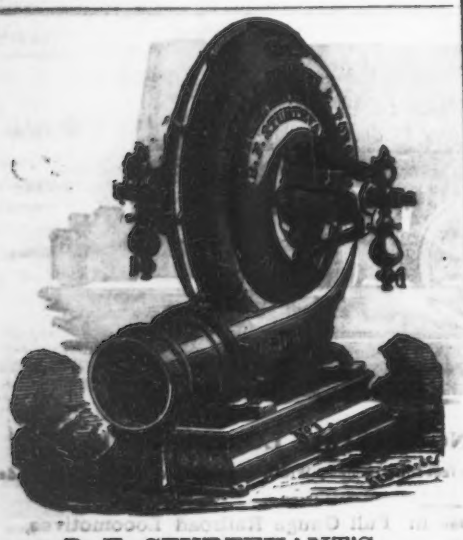

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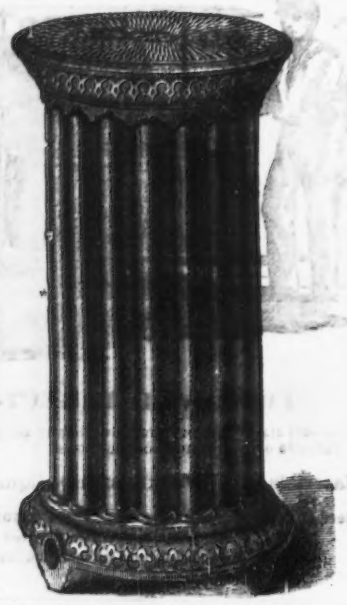

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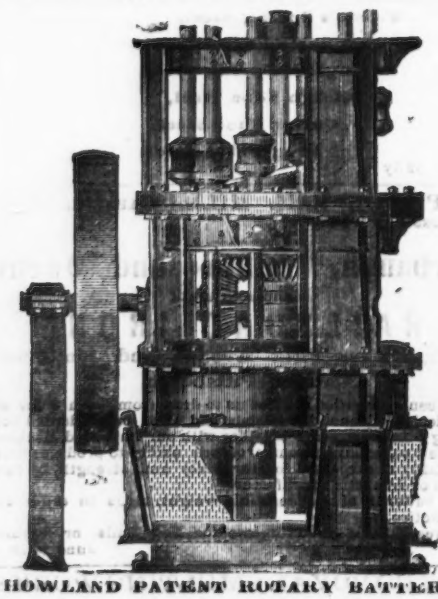

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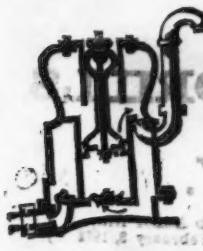

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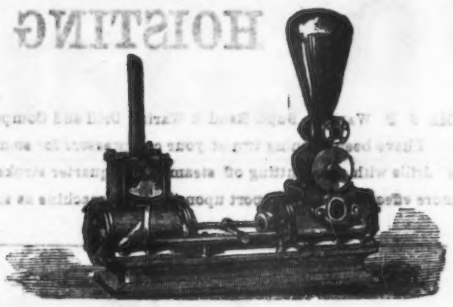

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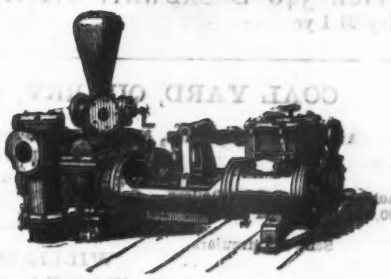

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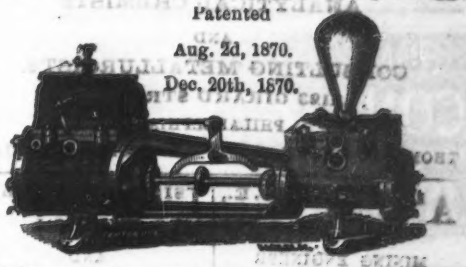

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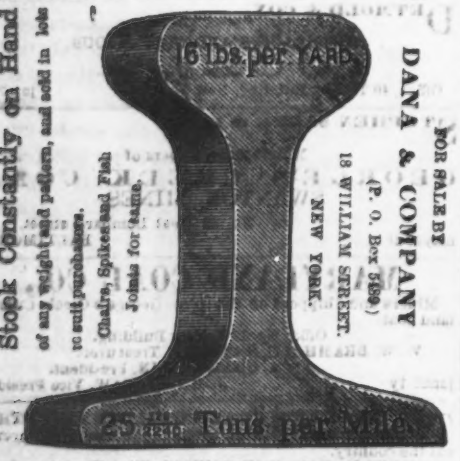

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